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Fourth World Forestry Congress

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Cover Photograph: *Mountain forests of* Cedrus deodara *at around 8,000 feet (2,400 m.) in the Chakrata Forest Division (Uttar Pradesh), India. The view is towards the Great Himalaya Range with 20,000 feet (6,000 m.) peaks in the background. (Photograph by A. Huber)*

TEN YEARS OLD

In October of this year the Food and Agriculture Organization will celebrate its tenth anniversary. By the nature of its responsibilities, FAO is an organization which must look and plan towards the future. But at this time it is not inappropriate to look back into the past.

The first of the new, permanent United Nations agencies to be launched since the war, FAO grew out of the Conference on Food and Agriculture held at Hot Springs, Virginia, in the United States of America, in May 1943. President Roosevelt was personally responsible for calling this conference which he associated with the first of the dramatic four freedoms of the Atlantic Charter - freedom from want.

The Hot Springs Conference set up an Interim Commission, representing the 45 countries which had sent delegates, to plan the organization of the new agency and draft its constitution. This work was completed by mid-1945 and half way through October of that year representatives of the interested nations met in Quebec. On 16 October delegates of 20 nations signed the constitution and FAO was formally in existence. Mr. Lester B. Pearson, Canadian Chairman of the Interim Commission, was able to open the first plenary meeting of the First Session of the FAO Conference.

There were few precedents for FAO to follow; as a working agency, it was something new in international history. The Forestry Division comprised four officers, although backed by a Standing Advisory Committee of individual experts of many countries and a host of well-wishers. Set against the world problems to be resolved, the resources of FAO were pitifully small, and the jobs that needed doing were obviously too many and diverse to be handled all at once. So the task was considered in terms of the newly-arrived big-game hunter who, confronted with the problem of how to eat his first elephant, was given the sage advice to "first cut it into little pieces."

FAO proceeded slowly along commonsense lines, helped by all the resources, often voluntary, that could be enlisted. The Organization is still in the stage of dealing with "little pieces", which at a glance, may appear unrelated. In sum, however, like the pieces of a jigsaw puzzle, they are balanced and form a recognizable picture or, as the last session of the FAO Conference expressed it, "an admirable pattern of useful and positive actions spread throughout the world."

The membership of FAO now totals 71 nations and is likely to expand still further. The responsibilities placed on the Director-General and his staff will certainly increase.

This year, when it is ten years old, the Organization will take stock of what has been accomplished over the past decade and of what has not been so successful. In the light of this review Member Governments will lay down their directives for the future.

Dehra Dun 1954

THE Fourth World Forestry Congress was held at Dehra Dun (India) from 11 to 22 December 1954. It was a marked success both in regard to attendance and the standard of the discussions on the subject matter of the program.

Members of the Congress were drawn from 46 countries and some delegations were large. All the States of the host country were represented so that the Indian membership amounted to over 180 persons. Other countries well represented were the United Kingdom, the Union of Soviet Socialist Republics, the Peoples' Republic of China, France and Pakistan.

I should have liked to have seen at the Congress those who, ignorant of the high development of forestry in India, had earlier expressed surprise that a meeting concerned with present-day forestry problems should be held in that country, implying that the Congress was merely an excuse for pleasure jaunts to the Taj Mahal and the vale of Kashmir at public expense. They would have been enlightened by the level of competence of those attending. They would have found the "excursions" to be serious study tours of Indian forests through which professional foresters learned much of value.

IT is at world congresses that new knowledge in the various fields of forestry can be brought into the open and where experts can discuss how best to bring about the fullest satisfaction of human needs from the produce of the forest and how to make the utmost use of this great natural resource, the forest.

But such congresses also serve for publicity purposes. In order to succeed in their mission, foresters need the backing of public opinion. I was, therefore, happy to find that the Government of India had appreciated this function of the Congress.

All the meetings of the Congress were attended by reporters from the leading journals of the country, and day by day the Indian reader found spread over two or three columns of his newspaper the fullest account of what transpired at Dehra Dun.

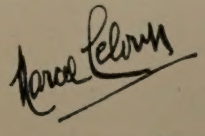
At the same time, an active publicity campaign was carried on to bring in visitors to the Forest Institute where the meetings were held. We often met in the corridors a continuous stream of men, women and children curious about the delegates who had come from all corners of the world. The visitors who listened to the discussions were, too, obviously impressed by the references to the importance of forests and timber in the economy of a country and to the many complex aspects of forestry.

MOST individuals attending congresses of this sort accept their value and welcome the opportunity to become better acquainted with the personalities of their colleagues from other lands and in other disciplines. Some, few in number it is true, remain sceptical in this regard and complain that they learn nothing. Such an attitude always exists but should not go unanswered. How many of us possess such an encyclopedic knowledge of forestry that there is nothing more to learn? Unless, of course, we deliberately want to shut ourselves off from everything outside our immediate narrow field of interest.

I, for my part, must avow that I never attend meetings of this kind, even the smallest, without learning something stimulating, and very often in a field which I least expected.

Still such congresses are concerned not only with techniques and practices but also with human problems, important not least in forestry. I am sure that from this standpoint those gathered at Dehra Dun learned many things, and especially that persons of varied lands with wide political and ideological differences had an admitted common aim to safeguard the future of the forest all over the globe. The Congress revealed a spirit of co-operation that is badly needed in a world which, experiencing some of the most startling of scientific discoveries, needs peace to allow the forests to thrive and to permit the living standards of its peoples to improve.

For this special reason, the Government of India which enabled this Congress to be convened, and all those from near and far who helped in its organization, deserve our congratulations and thanks.



Director, Forestry Division

Fourth World Forestry Congress

by FAO Staff

One of the early actions of the Fourth World Forestry Congress was to prepare for the Fifth Congress. This, in itself, is perhaps a measure of the value attached to this gathering, which may be regarded as providing the forum for an exchange of views between experienced technicians, administrators, men of science and others interested in forestry, and for discussions on all aspects of forestry, leading to the formulation of broad recommendations applicable on a regional or world-wide basis. The carrying out of these recommendations as they may consider best is a matter solely for those to whom they are addressed — governments, international organizations, scientific bodies, forest owners, and so on — because a World Forestry Congress is purely an advisory body without executive functions. It consists of enrolled members who are free to express their personal opinions and neither speeches nor written papers in any way engage the responsibility of the departments, agencies or other bodies to which the members may happen to belong.

To help make the next world congress a stronger link between policy and practices, the Dehra Dun Congress decided that a Preparatory Committee should be formed comprising foresters drawn from India (the present host country) Argentina, Australia, China, France, Italy, Japan, Sweden, Federal Republic of Germany, the United Kingdom, the United States of America, the Union of Soviet Socialist Republics, and FAO. This committee would be called to an early meeting at FAO Headquarters to select in clear outline the topics for consideration on the next occasion and to make all the necessary advance preparations. The next host country, when known, would also nominate a representative to the committee. Already at Dehra Dun a formal offer was received for the Fifth World Forestry Congress to be held in France in 1960.

Principal Results of the Congress

In his message appearing in the special number of *Unasylva* issued last September, the Director-General of FAO stated what he was expecting from the Fourth World Forestry Congress:

> "Not directives which only governments can give, but instructive information and advice on which those directives can be based and, following which, I can see that our abilities for service can be made most effective."

Read in this light, the report of the Congress carries much which is of interest.

Progress in World Forestry

The first part of the program of the Congress entailed a review by Marcel Leloup, Director of the Forestry Division, FAO, of the progress made in world forestry over the past five years. Taking the recommendations of the Third Congress singly, he considered that there was not one on which progress had not been made. Sometimes this was evident on the world level and sometimes at a regional level, and perhaps in some cases in specific countries only. Nevertheless, all this progress seemed small indeed set against what remained to be done, as revealed by analysis of the figures obtained from the latest FAO inventory of the forest resources of the world. There were, therefore, no grounds for complacency. But probably no one would deny that "forestry" is now more widely known, understood, supported and practised than in 1949, the year of the Helsinki Congress.

Arising from its review of the present status of forest management in the world, the Congress set up three committees to examine pertinent points that had been raised.

Classification of forest types

The difficulties of forest classification, the question before the first committee, are known to all foresters. A solution is necessary not only to satisfy the botanist and scientist but because, from the practical standpoint, the determination of both forest policy and silvicultural treatment, so that forests can best contribute to economic development, presupposes an ability correctly to determine forest types.

Many classification systems have been suggested. In a report that was given close attention, the U.S.S.R. delegation explained the method now successfully employed in Russia and, after discussion of that report, the Congress proposed that the International Union of Forest Research Organizations (IUFRO) should set up a study group of experts to examine the possibility of standardizing the various suggested systems.

Professional training

Another point referred to a committee related to the professional training of foresters. Particularly it was felt that the need for men to have a comprehensive view of international forestry problems was not being adequately met. The Congress eventually proposed that FAO should establish a panel of education specialists who, through correspondence and meetings when suitable opportunities arose, could advise the Organization on problems relating to the whole field of forestry and specialized education.

Bibliography

The third committee spent its time reviewing the work of the joint FAO/IUFRO Committee on bibliography, the importance and utility of which was fully recognized. It was recalled that the *Oxford System of Decimal Classification for Forestry* was one outstanding achievement of the efforts of this body, working in close co-operation with the Commonwealth Forestry Bureau at Oxford, and that it was now embarked on the arduous task of compiling a multilingual forestry dictionary, an undertaking that had already been recommended by the Third World Forestry Congress.

The Congress commended the Oxford system for adoption in all countries, and hoped that national agencies would arrange for translations to be made. With regard to the multilingual forestry dictionary, the FAO/IUFRO Committee was following the procedure recommended by the United Nations Economic, Scientific and Cultural Organization (UNESCO) for scientific and technical multilingual dictionaries, and this was approved by the Congress. An initial step, already taken in some countries, is the setting up of National Terminology Committees. The Congress called on all countries, that had not yet done so, to create such bodies, if necessary in consultation with other countries of the same language group.

Protective Functions of the Forest

A definite question was placed before the Congress, namely, what criteria should be used in assessing the extent and distribution of the lands which must be reserved under forest or other types of natural vegetation, or be restored to such cover, for protective purposes.

In answer, the Congress stated that in some cases forests and the grasslands frequently associated with them in nature afford protection which they alone can provide, for example, protection against the desiccating effects and erosive action of winds; protection in mountain regions against avalanches and rock falls; protection of springs and the steep banks of water courses; the stabilization of moving sand; and perhaps even an improvement in the purity of air in the neighborhood of towns. Such areas must be retained under natural vegetative cover.

In all other cases, the protective function of the forest may probably be replaced by the application of certain techniques, such as the use of fertilizers, special soil treatments; the construction of benches, terraces, etc. It is to be noted that they involve heavy expenditure of money, equipment and labor and postulate the attainment of a certain level of economic and social advancement. Until the latter condition is fulfilled, clearance of natural cover must be absolutely forbidden. Also it should be clearly understood that, even where circumstances would appear to warrant extensive clearing, the effects on the climate and the biological equilibrium are incalculable with the present state of scientific knowledge. Those responsible for such clearances must therefore act with every caution.

Competition between the different forms of land use makes a thorough knowledge of the various influences of the forest and forest grazing lands on soil, water, climate, etc., increasingly necessary. The insufficiency of this knowledge is demonstrated today by the controversies attending certain afforestation operations which appear to have had unfavorable influences on water supply. Consequently, the Congress recommended that research on forest influences, particularly in water catchment areas, be pursued or initiated in all parts of the world.

FAO, in collaboration with IUFRO and, if necessary, with other scientific international organizations such as UNESCO, should undertake to collect and synthesize the results of experiments and observations already available from a number of countries, and should disseminate such information for the furtherance of research and for the guidance of countries in their land-use policies, and in how to manage catchment basins in river-valley development projects.

Aside from catchment areas, notably under certain tropical or arid conditions, the forest also plays an important and often essential role in the protection of the stability and fertility of the soil. Should it be destroyed, reforestation is frequently very difficult and may often involve great expense. While techniques have been worked out for podzols and marshy lands of the temperate or cold zones, the reforestation of denuded laterite soils of the tropics and the alkaline soil of arid zones still presents formidable problems. The precise role that forests can play in desert reclamation is still to be determined.

The Congress recommended that large-scale afforestation of degraded lands be undertaken only after research on the methods and species to be used, and on the prospective economic returns from the forests under creation both to the local population and to the nation as a whole. Such research should extend over a considerable period, since early success with planting does not guarantee the establishment of a valuable forest.

If the desired result of soil stabilization and correction of the water regime can be obtained at less expense and to the greater benefit of the local population by methods other than afforestation, such methods should be preferred. Attention was drawn, for instance, to the reclamation of grazing lands by control of stock and/or by range improvement, with the possible introduction of fodder trees, and to the use of fruit trees.

Shelterbelts are an instance where forests or even tree plantations play an essential role in protection against wind and its erosive and desiccating effects. However, not only is establishment costly but it frequently antagonizes the cultivator, who complains in particular of the reduction in the yield of his crops adjoining the shelterbelts and of the multiplication of pests, diseases and animal vermin in such belts.

Research on shelterbelts has been carried out chiefly in temperate zones, and needs to be extended to the tropics. For arid regions, such research should be considered an exceptionally important part of the work to be undertaken by any international forestry organization set up for studying arid zone problems.

In concluding the part of its work on the protective functions of the forest, the Congress recognized that education in the conservation of natural resources in general, and of the forest in particular, is essential at every stage of the education of young people and should also be extended to adults. The concept of conservation and its fundamental importance for human

welfare must be firmly implanted in the minds and conscience of mankind.

Various approaches were reviewed, but it was agreed that, especially in the case of the young, it is essentially the business of those professionally concerned with education; the conservationist should not participate without prior consultation. Action is impossible without the whole-hearted support of governments, who are often too little apprised of the problems and importance of soil and water conservation or are hampered in doing anything constructive by other considerations. The acceptance by governments of certain policy principles of soil and water conservation to be formulated under international authority, would appear to afford the same advantages as the FAO *Principles of Forest Policy* that received general recognition in 1951.

For FAO this is a particularly important recommendation. If it receives firm support in government circles, then the Organization will proceed to incorporate these forestry principles into a larger frame.

Productive Functions of the Forest

Here again, the task before the Congress was to set out the criteria for determining what portion of the national area should be kept under productive forest.

Ideally, the area should be determined by the need for ensuring the welfare and stability of populations, and the satisfaction of the timber needs of the country. Insofar as the latter is not completely possible, a parallel criterion applies as in the case of protection, namely, that lands whose best capability is permanent forestry should be dedicated to forest. Even if the financial returns from such lands are low, they are still higher than can be expected from conversion of the area to another use. But where lands are of marginal use value, depending on and varying with the social and economic structure of the human community to which they belong, an appraisal of these social or economic values must be the deciding factor for or against forestry. It is to be remembered that in appraising the financial returns from lands put to forest use, it is presupposed that the best management practices will be put into operation.

The extent of the productive forest required is therefore likely to vary. Changes in economic conditions should be met by the adaptation of the growing stock, and of new plantings, to the new needs of the market, without compromising the biological structure of the forests. Management methods should aim, in the first place, at sustained-yield of the greatest quantity and the best quality timber.

There are few countries in which production in the forest is limited to timber alone. It is in fact by no means certain that specialized single-purpose land use, particularly on a permanent basis, is ideal. In some social and economic environments, such specialization would certainly not help towards reaching the desired goal of deriving the maximum yield from the land for the benefit of the community as a whole. This the Congress implicitly recognized by accepting the principle of " multiple use " of the forest. For instance, one of the most ancient uses of the forest is for the raising of livestock, and the Congress also gave regard to managing the forest as a wildlife refuge and source of game, and to provide recreational facilities. Several useful recommendations were made in this connection: the development of true silvi-pastoral plans of management, where feasible; the employment of all possible methods of improving the quantity and quality of fodder trees and grasses; wider recognition of the fact that " wildlife is an integral part of the forest complex and its proper treatment and maintenance are important to mankind; " and encouragement of the proper use of forests for recreation, by public education and the formulation of satisfactory policies and management methods.

Lastly, the Congress recognized that, even from the economic standpoint, the conjunction of forest use, or at least of tree plantations, with agriculture on the same land is often the best way to use the land most fully. It strongly recommended that tree plantations " outside the forest " should be encouraged, particularly where the existing forest is inadequate to meet agricultural or other domestic requirements. Due provision should be made, if necessary, for control by forest departments. Encouragement might take the form of education and propaganda, including organized tree festivals and the free issue of suitable planting stock.

Utilization of Forest Products

It has already been mentioned that any thinking on how much land should be dedicated to forest assumes that a proper standard of forest management will be maintained. This is patently interwoven with the assumption that there are outlets for the raw materials provided through forest management. Unless the produce of the forest can be put to economic use, there is no call for silviculture, and if then the forest does not serve a necessary protective function, even the occupation of the land by trees may be hard to justify.

The Congress gave attention to a number of problems bearing on a fuller and more rational use of raw materials obtainable from the forest, better marketing of forest products, and a lowering of prices to make it possible for wood to compete effectively with the growing and well-advertised array of alternative materials or substitutes.

Ways of keeping costs down included the proper training of forest workers, improving the efficiency of work techniques, introducing the right tools for the job, and, in many cases, a degree of mechanization of forest operations. Such measures would have an impact on wages and, in general, on the living standards of forest workers. Governments should see that research was conducted on these various problems, and FAO should continue with the various activities that it had launched in this field, such as the creation in Europe of a working party of experts on improving logging techniques; making widely known the latest developments in equipment used in forest enterprises; and the organization of training centers and study tours.

A factor inducing high costs of working tropical forests was that a large number of species were not at present marketable. Even in the temperate countries there is scope for increased utilization of hardwood species. Discussion revealed that by appropriate pro-

The Inauguration of the Fourth World Forestry Congress in the Convocation Hall of the Forest Research Institute, Dehra Dun, 11 December 1954

The Governor of the State of Uttar Pradesh, as Chairman of the Reception Committee, welcomes the President of India, seated on his left. Next to the President is the Minister of Agriculture. On the right of the picture Marcel Leloup, Director, Forestry Division, FAO, and C. R. Ranganathan, Inspector-General of Forests, India, who was elected President of the Congress.

Co-Presidents elected were D. A. Macdonald (Canada) and V. N. Sukachev (U.S.S.R.). E. Saari who had been President of the Third World Forestry Congress at Helsinki in 1949, was elected Co-President honoris causa.

Ministers and delegations from all the States of India participated in the Congress, together with representatives of professional and trade organizations. Foreign members totalling 150 were drawn from 45 countries and six international organizations including FAO, the United Nations Economic, Scientific and Cultural organization (UNESCO), the International Labour Organisation (ILO), the World Meteorological Organization (WMO), the International Council of Women (ICW) and the International Union of Forest Research Organizations (IUFRO).

Countries from which members came were:

Afghanistan, Australia, Austria, Belgian Congo, Bulgaria, Burma, Canada, Ceylon, China, Czechoslovakia, Denmark, Ethiopia, Fiji, Finland, France, Germany (Western), Germany (Eastern), Hungary, Indonesia, Irak, Iran, Israel, Italy, Japan, Laos, Malaya and Singapore, Nepal, Netherlands, New Guinea, New Zealand, Nigeria, Pakistan, Poland, Romania, Spain, Sweden, Switzerland, Tanganyika, Thailand, Turkey, Uganda, United Kingdom, United States of America, Union of Soviet Socialist Republics and Viet-Nam.

cessing, such as seasoning and preservative treatment, a large number of hitherto unused species could be utilized for construction, ship-building and other special purposes. Some countries reported considerable progress in this direction, for example, the development of a special method of gluing in a fluid thermic medium with simultaneous impregnation to make large size wooden members out of small-dimensioned materials. There was a trend towards wider markets for some secondary species, which, however, was hampered by want of technical information on their properties and susceptibilities to insect attack and decay. The need for better grading according to standard specifications was stressed. Though a great deal has been done recently to overcome these drawbacks, much ground remains to be covered.

The role of forests in the economic development of a country must be measured not only by the goods and services they furnish, but also by the manner they contribute to the establishment and maintenance of key forest industries. In recent years, design of housing has assumed increased importance. Solid wood is giving place to processed materials with improved properties. With recent technological advances, it is now possible to produce large panels of plywood, chipboards, fiberboards, etc., often derived from the utilization of "waste" products, resulting both in economy in construction costs and fuller utilization of the forest crop. Prefabricated construction usually lowers cost but standardization of designs and knowledge of the stress-grading of components are the necessary pre-requisites.

The Congress recommended education, demonstration and propaganda for the guidance of civil engineers and architects as well as administrators, industrialists and consumers. This should also be extended to engineering schools and colleges. Training of personnel in operating modern wood-working machinery needed also to be extended.

The consumption of paper in the world is on the increase. It was felt that high priority should be given to the search for new sources of raw materials, not only for pulp but also for the preparation of sugar and power alcohol. Most of the pulp and paper production in the world continue to be based on the traditional conifers such as spruce, fir, and pine, but other species such as eucalypts and poplars have fair possibilities. Some tropical countries are using bamboos and grasses. Recent activities of FAO have focussed attention on the potentialities of tropical hardwoods and agricultural residues.

Lastly, the Congress discussed the economic importance in many countries of forest produce other than wood. India exports, for example, about U.S.$ 100 million worth of minor forest products annually, and such products are also of great economic importance in the Mediterranean and Latin American regions. Dependable products in assured supply in respect of quality and quantity, and more efficient production at low costs will result in better markets. In the case of medicinal herbs, a better knowledge of the chemically active substances and their pharmaceutical properties, sanitary production in standard quality and assurance of sustained supply would contribute considerably to their extended use. Due to sparse distribution under natural conditions, collection of such forest produce becomes uneconomic, and adulteration is common. This could be eliminated by cultivation under controlled conditions which would incidently also provide scope for improving the yield of the effective chemical constituents.

Tropical Forestry

It may be recalled that, owing to the difficulties experienced by FAO in organizing the special world conference on tropical forestry which had been requested by the Third World Forestry Congress, it had been agreed that the subject be given prominence at the India Congress. In the event, this proved a wise decision and the discussions at Dehra Dun were generally animated, comprehensive and more detailed than was the case for the other topics on the program.

Tropical Rain Forest

Starting with methods for improving mixed tropical rain forests, the Congress agreed that foresters of all tropical countries have as their common objectives the enhancement of the economic value of their forests. Methods of improvement, both natural and artificial, aim at getting a greater proportion of valuable commercial timbers.

Under the varying conditions encountered it is impossible to select a single silvicultural system which can be safely recommended to ensure the desired development of the forest. Techniques currently used, whose details still vary with local conditions, fall into three main groups:

1. The old stand is removed in periods varying from one to five years and is replaced by a more or less even-aged crop recruited from advance growth or from induced natural regeneration. Variations of this method have been tried in Malaya, Nigeria, the Andaman Islands and Ceylon.
2. Regeneration is induced by selection fellings.
3. The stand is enriched by the artificial introduction of valuable species.

In spite of the different methods employed, certain problems of common interest remain and were frequently referred to in the course of the Congress discussions.

In general, the silviculture of the tropical rain forests is still of an experimental nature. It has benefited little from the traditional practices of the temperate regions, and operations which are being carried out extensively in important tropical areas are still of recent origin.

The Congress recommended that FAO should establish in consultation with IUFRO and in close collaboration with Research Centers and Forest Services, a procedure for the collation of information and for the studies and controls required for experiments in silvicultural methods aiming at the improvement of tropical forest stands.

It is often stated that the chances of satisfactory development of these forests are precarious and distant. Some experts have consequently come to the conclusion

that it is best to clear the natural forest and to replace it by pure plantations of quick-growing trees capable of producing an abundant supply of raw material, particularly for pulpwood, better adapted to the economic necessities of today. Foresters therefore find themselves faced with a dilemma. Is the tropical forester to continue to concentrate his silvicultural efforts on development of the mixed forest and then expect industry to adapt its techniques to the type of raw material this class of forest will provide? Or must he, on the contrary, seek to adapt forest production to specific industrial needs and to consumer requirements?

There was considerable debate on the policy to be adopted in tropical regions, with notable contributions from members from Australia, Belgian Congo, France, India, Indonesia, Nigeria, Pakistan, Tanganyika and Uganda. The conclusions may be summarized as follows:

1. The need is for the maintenance of a stable biological forest environment. Natural methods of forest enrichment ensure this, but there are nevertheless grounds for the view that pure plantations of well-adapted species will in time progress towards a form of association sufficiently stable to avoid dangers of a biological nature, provided certain precautions are taken. These biological dangers may, however, be serious in the case of pure plantations of quick-growing species managed on short rotation, and this method should, in any case, only be considered when the quality of the soil permits.
2. The type of forest products needed must determine the methods to be employed. The problem set, therefore, varies according to whether the region is densely populated and local needs are high, or whether it is underpopulated and there are few local requirements. The permanent supply of local needs must have first priority. Since long-term requirements are difficult to foresee and are liable to vary, it is necessary to give a certain flexibility to production. The mixed forest is best suited for this. For the pure stand, if it has to, or can, be used, one must choose species which are both high yielding and multi-purpose.
3. Since the maintenance of the mixed type of forest on a long-term basis is advisable biologically and even economically, it is essential to institute intensive technical, technological and industrial research with a view to as full a utilization as possible of the products.

The Congress suggested that research should concentrate on the ecology of the economically important species and communities with a view to determining the most favorable environmental conditions; methods of treatment, e.g., thinning techniques, reservation of seed bearers, control of competing species, felling intensity and cutting cycles; effect of fire and grazing; protection against insect and fungi; and on the preparation of up-to-date volume and yield tables and collection of growth data.

Artificial Regeneration and Formation of Plantations

Discussion of silvicultural methods for the tropics cannot be dissociated from consideration of the techniques of artificial regeneration (although afforestation and the formation of plantations is a broader subject). The Congress emphasized two points to be kept in mind when contemplating any planting program: the necessity, first, of ensuring soil conservation and fertility, and secondly, of establishing stands that will give a regular, sustained and as high a yield as possible. In the third place, plantations must not encroach upon land needed for farming nor make undue inroads on irrigation water supplies. Lastly, the cheapest and most profitable methods of establishing plantations must be sought. The silvicultural techniques to be adopted must be largely guided by the economic factor.

Afforestation and reforestation with exotic species have come to be of considerable interest in many tropical countries. Eucalypts and poplar have often proved more rapid producers of timber than indigenous species; coniferous species are of great importance from the industrial and economic standpoint; teak from Asia and Indonesia has also become an important exotic species in Africa and elsewhere during the course of the last forty years. All these exotics present special problems to the silviculturists of the countries in which they have been, or may be, introduced.

The Congress proposed that interested Member Governments of FAO should consider creating an international commission on exotic species for planting in the tropics, on the same lines as the International Poplar Commission. The Commission would assume the responsibility for the collection and dissemination of information in its field. It would also ensure the facilities and guarantees necessary for the purchase, exchange and introduction of seed and seedlings of exotic species, whether for experimental work or for operations on a large scale.

Arid Zone Forestry

Afforestation techniques assume particular importance when the assistance of foresters is required in the fight against the spread of desert conditions and in the utilization of regions on the margin of deserts. Under absolute desert conditions, the forester cannot, of course, do anything and the Congress was concerned only with zones believed to be capable of supporting useful vegetation, although receiving a rainfall below 20 inches (500 mm.).

The Congress acknowledged the importance of the action of man, and specially of his cattle, on the spread of desert conditions. The application of simple administrative regulations will not stop this spread. Before embarking on any radical measures, it is necessary to try to improve conditions in the pre-desert zones so that the people and their cattle can live without causing any damage. This entails pasture improvement, recreation of forests and the revision of agricultural policies. No such program can be undertaken in any country unless it be based on the results of thorough research, for in this field even minor set-backs may have serious consequences.

Valuable studies have been carried out in many countries, and it is time for their results to be placed at the

disposal of all concerned. Countries should exchange technical information and facilitate the exchange of seeds and plants adapted to the special conditions obtaining in arid and semi-arid and sub-desert regions. The Congress accordingly proposed that an international commission be created on forestry in arid zones, to be made up of groups within each of the interested countries and with a secretariat supplied by FAO. Such a commission should work in close co-operation with the permanent committee on arid zones organized under the sponsorship of UNESCO, which is specially concerned with the basic knowledge necessary for carrying out technical and administrative measures.

The commission should be concerned particularly with the species adapted to the various sub-desert conditions and their ecology, techniques of afforestation, the legislation needed to implement policy and assist the application of techniques; the measures to be taken for protection, rehabilitation, or creation of forests either as blocks or shelterbelts, for range management, and the conservation of soil and water.

Epilogue

The foregoing are only the most prominent among the results of the Dehra Dun Congress. Many other points were covered and useful advice given, which will influence FAO action in the years ahead. One topic that this Congress did not consider [illegible] may well form a valuable subject for discussion [illegible] is the possible implications for forestry of the peaceful uses of atomic energy, a matter to which attention is now being given by FAO. That, however [illegible] in the future, and for the present this summary may be appropriately concluded by quoting some of the words of the President of India, used when he formally inaugurated the Fourth World Forestry Congress.

> "Forestry is not an end in itself. As an aspect of land utilization, its value and significance are exactly in proportion to the sustained contribution it makes to human welfare, tangibly and directly through the produce that comes out of the forest and the numberless products that these materials may be processed into: subtly and indirectly by protecting the soil and conditioning the climate thereby sustaining the physical bases of life; by providing a refuge and home for wildlife which but for the forest would perish and disappear from the earth: and not the least through the recreational and aesthetic benefits of forests. In India, the forest in closely bound up with our religious and spiritual heritage. Whatever function the forest performs, the touchstone and measure of its value is human satisfaction."

Article translated from an original French text.

FAO FORESTRY MISSION IN CHILE

Conspicuous among the achievements of the forestry mission in Chile are the forest extraction and sawmilling demonstration center at Llancacura, and the forestry school at the University of Santiago. The mission, comprising six experts, will be continuing its work through 1955. Its activities over the past three years have been guided by E. I. Kotok, formerly Assistant Chief of the United States Forest Service. High government authorities have expressed their great appreciation of the services rendered by Mr. Kotok, who has now retired from his position as leader of the forestry mission and head of all FAO missions in Chile. The photograph shows Chilean araucarias in wintertime in the *Parque Nacional, Los Paraguas*, a scene familiar to the members of the FAO Forestry Mission.

By courtesy of the Departamento de Bosques, Chile.

Planting in Tropical Africa

by M. S. Parry
Forest Department, Tanganyika

FAO is issuing a series of concise publications as parts of a World Forest Planting Manual. *Some of these have already appeared and others are in course of preparation. The writer was commissioned to compile a short manual, the purpose of which would be to give an outline of the methods of tree planting commonly employed throughout the tropical zone of Africa, and also to summarize briefly the characteristics of the species most commonly planted.*

This manual is now finished and will shortly be published. Information was obtained from published literature, unofficial notes and circulars, and also from private communications from a number of forest officers serving in the countries of both West and East Africa.[1] *In this article, the writer recapitulates the features of the environment with which he is dealing.*

Tropical Africa is taken to include the whole geographical zone lying between the tropics of Cancer and Capricorn, and includes a large and rather heterogeneous assemblage of countries, embracing an immense diversity of planting conditions, from alpine grasslands to coastal mangroves, and from the wettest of rain forest to semi-desert. Until quite recently, there has been comparatively little interchange of ideas and information between the many separate countries within this great area. Consequently, it is not unusual to find that the techniques used even for the commonest species often vary considerably from place to place. There are several well-known nursery and planting techniques which have been adopted with local adaptations in most parts of tropical Africa, but there is surprisingly little uniformity about the conditions and species to which they are applied.

A certain degree of stability has been attained in the techniques of softwood planting but, with few exceptions, most of the indigenous hardwoods are planted by methods which vary not only from place to place, but often from year to year in one nursery — a sure sign that the foresters concerned are still feeling their way from one partial failure to the next. In most countries, following a period of postwar expansion, there has been a phase of increased silvicultural research, the results of which will no doubt form the basis of standardized techniques in the future. It is inevitable, therefore, that any attempt to compile a handbook of planting methods for tropical Africa at the present time is bound to be considered somewhat premature but it is felt that a review of the methods now employed will serve a useful purpose. Research is a never-ending process and it is unlikely that silvicultural techniques in the tropics will ever become rigidly codified. This article, therefore, attempts to describe the available techniques in rather general terms with examples of their application. Planting methods must always be adapted to particular conditions on the basis of local experiment.

[1] The author makes special acknowledgement to A. Aubreville, Inspecteur général des eaux et forêts, Ministère de la France d'outre-mer; C. J. Taylor (Gold Coast); A. L. Griffith, East African Agriculture and Forestry Research Organization; H. C. Dawkins (Uganda); H. H. Pudden (Kenya); and to the Government of Tanganyika.

Climate

General considerations

Any attempt to subdivide a large region into distinct climatic zones is bound to be artificial, particularly if the subdivision is done with a view to the selection of species suitable for each zone. Not only does climate grade imperceptibly from one place to another, but its effect on tree growth is modified by other conditions, particularly by soil fertility and by the amount of subsoil moisture available. Moreover trees vary a great deal in their adaptability, some being restricted within narrow limits and others growing successfully over a wide range of conditions. None the less, climate is the main factor determining the suitability of an area for tree growth, and therefore the most convenient basis for deciding which species will be suitable for a particular locality.

The climatic regimes of tropical Africa are governed primarily by the bi-annual swing of the sun and its attendant wind systems across the equator. In very general terms, the wet seasons follow the sun (lagging about a month behind), with the result that throughout most of the equatorial zone there are two wet seasons each year. At the equator itself (or, more accurately, at the "rainfall equator" which lies about 3 degrees north) the peaks of the two wet seasons occur about a month after each equinox. As one goes north or south from the equator, the two wet seasons move closer together until they coalesce into one wet season. In the northern hemisphere the rains coalesce in the northern summer (July) and in the south they coalesce in the southern summer (February). Owing to the northward shift of the "rainfall equator" the single wet season does not occur until about 8 degrees north, whereas in the south it is difficult to detect any marked double season more than 3 or 4 degrees from the equator, though a slight break in the rains may occur in February. The heaviest rains always occur with the northward movement of the sun.

These general influences are of course much modified by local topography and by distance from the sea or lakes. In general, local conditions have a great effect on the total amount of the rainfall, but very little

effect on the march of the seasons, though there are a few exceptions to this.

In those parts of tropical Africa which have a cool season, such as the highlands of East Africa, the coldest part of the year is usually the dry season, and the climatic regime is of the kind known as the "summer rainfall" type, as distinct from the "Mediterranean" type which is characterized by a hot dry-season and a cool wet-season. The distinction affects the growth of certain species and is one of the reasons for the success of Caribbean species in the highlands of East Africa and in the summer rainfall areas of South Africa.

The main factors determining a climatic type are rainfall and temperature. As temperature is determined largely by altitude, it is common practice to describe a particular set of conditions by the basic criteria of:

(*a*) the average annual rainfall;

(*b*) the altitude.

But these two alone can be a dangerous over-simplification if used as the basis for predicting the suitability of an area for tree growth.

In tropical Africa, the distribution of rainfall is affected largely by whether it falls mainly in one or two wet seasons. The single short wet season followed by a long drought of six months or more imposes conditions which are more severe than those with the same total precipitation divided between two seasons. The single wet season is often preferable from the point of view of securing establishment of plantations, owing to the fact that planting conditions are often better and more reliable, but unless the total rainfall is high enough to eliminate any danger of drought the double season will be more satisfactory for sustained growth. The minimum rainfall for a given species may be 10 inches (250 mm.) higher in a single season area than with a double season.

The effectiveness of rainfall is affected also by humidity. As a rule rainfall and humidity are closely correlated, but in some places a high humidity may occur with a low rainfall, for example in mountains subject to prevalent mists, where the low rainfall gives a false impression that the area is dry. In fact, excellent growth of softwoods may occur with barely 30 inches (760 mm.) annual precipitation, under mist-bolt conditions. Even more important sometimes is the effect on microclimate of the vegetation itself. Many important forests in Africa, particularly at their drier limits, are of a relict nature, and are able to persist mainly by virtue of their own influence on the local environment. If the economic species in them have to be replaced after exploitation by planting, it may be necessary to devise an under-planting technique even though, theoretically, it should be feasible to clear-fell and replant in conjunction with crop cultivation.

Temperature in tropical Africa is influenced mainly by altitude above sea level, but what appears to be equally important is the relative altitude in relation to the surrounding country. Thus the climate at 4,000 feet (1,200 m.) on a mountain rising steeply from a low-lying plain will be much cooler than at the same altitude and with the same rainfall in the center of one of the immense plateaus which are a feature of the African hinterland. The best criterion of temperature is therefore not altitude but mean temperature itself, though within a limited region, altitude is easier to refer to, because temperature data are frequently unknown. The best temperature data for defining type are the mean summer maximum (i.e. mean daily maximum for the hottest months of the year) and the mean winter minimum. Absolute maxima and minima are of less interest except that in areas subject to frost it is desirable to know the extreme minimum likely to be experienced.

Sub-divisions into silvicultural zones

With the above considerations in mind the innumerable different climatic types of tropical Africa are here grouped into seven broad categories. It is emphasized that these are not distinct climatological units, which would be far too numerous for the present purpose, but are merely a convenient way of subdividing an immensely varied region into a manageable number of zones. Most species will grow throughout the whole of one zone, and many of them will grow in several. The zones selected for this purpose are as follows:

Zone I. — Wet tropical lowland

Such very high rainfall areas, with 70 inches (1,800 mm.) or more each year, have a high uniform temperature with little seasonal variation. The altitude is from sea level to about 1,500 feet (450 m.). Mean maximum temperature is about 85° to 90°F (29° to 32°C) in the hottest month, and mean minimum about 70°F (21°C) in the coolest. It includes the wetter rain-forest areas of West and Central Africa and limited foothill areas in the coastal plain of East Africa. Near the equator there is no marked dry season and there are two rainfall peaks, but at higher latitudes there is a well-defined single wet season with a marked dry period, but humidity is always high.

Zone II. — Moist tropical lowland

Moderately high rainfall between about 40 inches (1,000 mm.) and 70 inches (1,800 mm.) a year, combines with a high uniform temperature. Altitude from sea level is up to about 4,000 feet (1,200 m.) under plateau conditions, or only up to about 2,500 feet (750 m.) on steeply rising land. Temperature variations have a slightly wider range than in Zone I, the mean summer maximum being 85° to 90°F (29° to 32°C), and mean "winter" minimum about 60° to 65°F (15° to 18°C). Three rainfall regimes occur within the zone viz: equatorial (two peaks), north tropical (July peak), and south tropical (February peak). This type of climate occurs over an immense and diverse area and would be capable of almost limitless subdivision. It is taken here to include the drier high-forest areas of West Africa, much of the Congo basin, and the wetter parts of the East African coastal plain. It is also taken to include the rather distinct and important forests of medium altitude such as those of Uganda, as many of the important species in them grow equally well down to sea level, whereas few of them are found much above 4,000 feet (1,200 m.)

Zone III. Wet montane

Moderate to high rainfall, from 40 to 70 inches (1,000 to 1,800 mm.) a year, occasionally exceeds 100 inches (2,550 mm.) in very localized areas. If the rainfall occurs in only one season, more than 50 inches (1,250 mm.) would be necessary to give conditions equivalent to 40 inches (1,000 mm.) in two seasons. Temperatures are cool, but rarely down to freezing point, the mean summer maximum being from 70° to 80°F (21° to 27°C), and the winter minimum about 50° to 60°F (10° to 15°C). The altitudinal range of this zone is mainly between 4,000 feet (1,200 m.) and 7,000 feet (2,100 m.), but certain freak localities rising abruptly from a plain, have a semi-montane climate at altitudes as low as 2,500 feet (750 m.) though always with a high, well-distributed rainfall and much cloud. This climatic zone occurs mainly on the east and south-facing slopes of the mountain ranges of East Africa.

Zone IV. — Dry montane

Rainfall is low to moderate at high elevations; annual precipitation from 25 inches (600 mm.) to about 40 inches (1,000 mm.) in two seasons, or 30 to 50 inches (750 to 1,250 mm.) in a single season. Altitude is mostly between 5,000 feet and 9,000 feet (1,500 to 2,750 m.). At the lower altitudes a rainfall less than 30 inches (750 mm.) in two seasons or 40 inches (1,000 mm.) in one season produces conditions merging into those of Zone V.

Temperatures are cool throughout the year, becoming very cold in the dry season; frosts are not uncommon above 6,000 to 7,000 feet (1,800 to 2,100 m.), with considerable diurnal variations, e.g., from 35° to 75°F (2° to 24°C). The zone occurs mainly on the higher East African "Highlands", and on the dry sides of isolated mountains.

Zone V. — Dry plateau

Rainfall is low to moderate, mainly from 25 to 40 inches (600 to 1,000 mm.) a year, or up to 45 inches (230 mm.) with a single season. Altitude is mainly from 3,000 feet to 5,000 feet (900 to 1,500 m.). Temperatures are fairly high just before the wet seasons but become cool during the dry season, the mean summer maximum often approaching 90°F (32°C), while the dry-season mean minimum is usually well below 60°F (15°C). Frost may occur at the higher levels outside the equatorial belt. This type of climate occurs over a very wide area on the broad plateau which covers most of the East African hinterland from Uganda to the Rhodesias. Very similar conditions but with higher average temperatures occur in Zone VI. All three types of rainfall regime occur within this area, ranging from the southern single February peak, through the equatorial double peak, to the northern August peak.

Zone VI. — Dry lowland

Rainfall is low to moderate, mainly from 25 to 40 inches (600 to 1,000 mm.) a year, with altitude below 3,000 feet (900 m.). Temperatures are very high during hot seasons with considerable diurnal variation. The mean maximum temperature of the hottest month is usually more than 95°F (35°C), and the mean minumum of the coolest month about 60° to 70°F (15° to 21°C). This type of climate occurs over an immense area stretching in a belt 200 to 300 miles (320 to 430 km.) wide right across the northern parts of the Guinea Coast territories from Senegal to the Sudan. In this area the rainfall regime is mainly of the north tropical type with a single peak in July-August, but a double season with a short gap in July-August may occur at lower latitudes. Similar conditions, but with the southern regime, occur in Angola and on the coast of East Africa. The Guinea coast from Gold Coast to Dahomey also has these conditions with the equatorial regime.

Zone VII. — Semi-desert

This is taken to include all areas with less than 25 inches (600 mm.) rainfall a year, regardless of altitude. Such conditions occur in a belt across Africa parallel to that of Zone VI but north of it, at about latitude 12°- to 15° N. Semi-desert also occurs in southwest Angola and in much of northern Kenya and Somaliland. There are also isolated pockets in central Tanganyika, and elsewhere in the rain shadows of the main mountains.

Soils

It would be quite impossible to attempt any sort of classification of the innumerable soil types of the tropical zone of Africa within an article of this nature. For such information reference should be made to published literature on the subject.

The following notes indicate the main soil characteristics which affect tree growth and suggest the points which should be examined when assessing a soil for the purposes of afforestation.

Topography

Steep topography should normally be no barrier to afforestation, unless planting has to be done with squatters. Even with squatters, slopes of up to 30 degrees can usually be planted quite safely as the land remains cleared for only three or four years, which is too short a period for the high permeability of the natural forest soil to be lost. Paradoxically, a loose friable soil is less liable to erode than a hard compacted soil. If planting is done directly into grassland or scrub, the limit of steepness is determined largely by the cost of road construction, which in turn depends mainly on the depth of soil and decomposed rock. On moderate slopes road construction may cost as little as £ 30 per mile ($52 per km.), but in steep country the cost will probably exceed 10 times this amount if there is undecomposed rock near the surface. Afforestation on land too steep for road building may sometimes be necessary for protective reasons or to "round off" a given acreage without leaving blanks, but as a general rule plantations without communications are to be avoided.

Soil depth

The important feature is rooting depth, which is not always the same as soil depth. In apparently shallow rocky soils, moisture often percolates into deep fissures

where the roots can penetrate also, giving quite good tree growth on a soil unsuitable for agriculture. If this can be observed, for example on a road cutting, or deduced from the growth of existing trees, the presence of rock near the surface need be no deterrent to afforestation. On the other hand the rooting depth may be quite shallow in soils which appear deep, the usual reason being that water is poorly distributed throughout the profile.

Permeability

Shallow rooting may occur because some soils have a seasonally high water table, indicated by gleying of the subsoil, while others are simply impermeable and, in dry country, rarely get wet in more than the top few feet so that trees have to live from one storm to the next solely on surface moisture. The surface run-off over impermeable soils is usually high and a large proportion of the rainfall may be lost unless the land is ridged on the contour. Trees nearly always prefer light permeable soils to compacted silts or heavy clays, though in coarse sands, if the profile is very deep, excess water from heavy stores may percolate rapidly down to a water table out of reach of tree roots. In this type of soil, trees which strike a taproot downward with vigor when in the seedling stage, like *Eucalyptus camaldulensis* and *Casuarina* are at an advantage over those like *Cassia siemea* which tend to root on the surface, whereas in a very impermeable soil the opposite might be the case. The maximum depth attained by the roots of certain dry country species is often over 50 feet (15 m.) and may exceed 100 feet (30 m.) but in many of the drier parts of Africa there is virtually no water table within 200 feet (60 m.) or more of the surface. All species are therefore to some extent likely to be dependent on surface water.

Fertility

The effect of soil fertility is felt mainly during the early years of the crop. With long rotations and fairly high rainfall the quality of the site probably depends more on the nature of the parent rock than on the fertility of the soil at the time of planting. This is certainly the case where worn-out fields of local cultivators are being planted. Growth at first will be better on the more recently fallowed fields than on those which have been temporarily exhausted, but one would expect these differences to become evened-up during the course of the rotation.

This is not meant to imply that fertility can be overlooked: in fact, on certain soils the success or otherwise of establishment may depend very largely on making use of the initial fertility of a soil before it can become exhausted. Deep, permeable sandy soils in high rainfall areas carrying degrazed forest or scrub are particularly liable to lose fertility when they are cleared for re-planting. On such soils, if squatters are used to clear the land, it may be essential to plant trees on the first break to take advantage of the temporary increase in fertility following a burn. If this is not done, the soil may become virtually unplantable (with exacting species) until it has undergone a slow recovery under a long bush fallow.

In certain parts of Africa the basic fertility of the parent material itself is very low, and quality of growth is limited by this factor alone. Much of the land under dry deciduous woodland of the type known as *miombo* tends to be inherently sterile, particularly if the profile is free-draining and the rainfall high enough to exceed evaporation. In northern Rhodesia, for example, tree growth is limited by the general sterility of the soil in many places where the climate should theoretically support closed high forest. When assessing the value of a site for afforestation, therefore, it is necessary to distinguish between a soil which is temporarily exhausted, and one which is inherently of low fertility.

For practical purposes the initial fertility of a soil can be judged most easily from the quality of the crops or vegetation growing on it. In most places, impoverished land can be detected from species which may be well-known to the indigenous population as indicators of poor soil. It is always useful and interesting to have definite analyses made of the soils, but it is difficult to know how to interpret the results. A soil chemist's report is more likely to indicate the suitability of the soil for certain agricultural crops than for a long-term forestry crop. The quality of tree plantations may depend ultimately on the availability of nutrients from still decomposing rock, combined with soil depth, aeration and moisture retention, rather than on the initial nutrient status at the time of planting. Analyses are of value mainly where there are indications of a definite nutrient deficiency. A few important species (e.g. *Chlorophora*) often exhibit symptoms which may be due to nutritional disorders and any information which may lead to the diagnosis of this condition is always worth obtaining.

A test of the acidity of a soil is always worth making, as many species are sensitive in this respect and will grow only within a limited range. Most pines, for example, (except *P. halepensis*) require acid soils with acidity in the range pH. 4 to pH. 6 for optimum growth. Most soils in tropical Africa tend to be slightly acid unless derived directly from calcareous rock.

Sub-soil moisture

Indications of the presence of sub-soil moisture should always be looked for, as this is frequently one of the main factors affecting the growth of trees. Few species will stand waterlogging for more than a few days, and soils liable to temporary inundations or a seasonally high water table must be classed as special sites. They may be very suitable for afforestation but species specially adapted to these conditions must be selected (e.g. *E. camaldulensis Lagerstroemia*, *Populus*, etc.). In dry country the presence of a water table at depth but within reach of tree roots can completely alter the quality of a site, but its presence is difficult to deduce. The occasional large tree in a very low rainfall district probably indicates the presence of water, but this may be a local seepage and may not mean that uniformly good growth will occur over the whole area. Sandy river courses usually have water close to the surface for most of the year and their banks are ideal for afforestation, except that the alluvial deposits on either side are nearly always valuable agricultural soils.

Mountain Timber Extraction

by A. Huber
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Yugoslavia and India are two countries geographically remote from each other and with a quite different historical development. Yet they are both now interested in high mountain logging and here they pose many similar problems. This the writer was able to observe at first hand when in 1952 and 1953, he carried out separate missions for FAO under the Expanded Technical Assistance Program to advise these countries on possible ways of improving extraction of timber from difficult mountain areas.[1]

Plans for opening up hitherto inaccessible stands are in fact becoming an increasingly important feature of forest economy in many mountainous countries throughout the world. As the more easily accessible forest resources become scarce or even exhausted owing to heavy utilization, interest is concentrated on mountain forests where often the last reserves of fully stocked forest have been left untouched, frequently consisting of valuable species such as conifers, not available at lower elevations.

As timber in the rough is a bulky material and thus difficult to transport over long distances, exploitation has for centuries tended to be restricted to the close vicinity of more densely populated centers of consumption and to forest areas from which transportation, generally by water, was relatively easy. Not until quite recently, and thanks to the development of modern transportation facilities, has it now become an economic proposition to tap remoter forests also. Today's logging enterprises tend, on the one hand, to push forward away from populated areas into the unexploited stands of the tropics and the far north, and, on the other hand, to the last frontiers of the mountain forest resources.

Another reason for the only recent advance of logging operations into mountain regions lies in the fact that forests in such areas have often been banned to commercial exploitation owing to the important protective functions which they exercise. The reluctance of governments to allow commercial exploitation, and particularly clear cutting practices, on this account is quite understandable. But, while barred to industry, mountain forests have also for a long time been, and still are, commonly abused by the local populations through overgrazing, lopping of trees, burning, and shifting cultivation, so that bans on commercial felling, however good the intent, which do not at the same time deal adequately with abuse by local populations, do not in effect prevent severe damage being done to the forests. Experience of FAO Technical Assistance missions has revealed this in several countries of Latin America, the Near and Far East, and also in parts of Africa.

But there are regions, as for instance some alpine parts of Germany, Austria and Switzerland, where careful selection cutting in mountain forests has been successfully applied on a commercial basis for almost a century, without interfering with the essentially protective role of the stands. On the contrary, it is realized today that mountain forests which are conservatively exploited according to sound cutting practices, are in an even better position to fulfil their protective functions than forests completely closed to access and thus not subjected to any kind of management.

India

To study mountain forest conditions in India, the writer spent several months in the hill belt between the northern plains and the Great Himalaya Range, in particular in the civil districts of Tehri-Garwhal and Dehra Dun (Uttar Pradesh), Mahasu, Bashar, Jubbal and Simla (Himachal Pradesh), and Kangra (East Punjab).

Although a wide variety of forest and working conditions was found in these districts, the problems were very much the same throughout the area, and are probably similar for the major part of all Indian high mountains west of Nepal.[2]

In the upper parts of the valleys of the Yamuna, Tons, Pabar, Giri, Sutlej and Beas rivers are extensive tracts of fir and spruce forests (*Abies pindrow* and *Picea morinda*). A large portion of the growing stock is, however, mature or overmature and thus partly deteriorating. These forests occur from roughly 7,000 feet (2,100 m.) to 11,000 feet (approximately 3,500 m.) above sea level, while the lower levels of the hills are covered by other forest types (*Pinus longifolia*, *P. excelsa*, *Cedrus deodara*) or else cultivated.

With the exception of the Beas valley, all these fir/spruce forests are accessible only on foot or by mule paths, being located from 30 to 100 or more miles (approximately, 50 to 150 km.) from the nearest motor road. Owing to their remoteness they remained almost in a virgin state until comparatively few years ago: during the second world war they were heavily cut over in many parts for the first time.

Contrary to general belief, most of these high mountain forests are quite easily accessible to human labor, and many are now being worked. Only the best timber is being extracted, however, and most of the lower grades, in size as in quality, are abandoned as waste. Official figures suggest that the conversion ratio is as

[1] Mr. Huber is now serving with the regular staff of the Forestry Division, FAO.

[2] A separate ETAP forestry mission has been conducted in Nepal.

Inspection of Himalayan mountain forests in winter. Villagers carry the author's camping equipment to the Forest Resthouse at Kaishdar (8,000 ft. – 2,400 m.) Kulu Valley, Punjab.

low as one quarter, so that 75 percent of the standing volume of the trees is being wasted.

The timber is produced in the form of sleepers in several sizes, up to approximately 12 feet × 10 inches × 5 inches (3.7 m. × 25 cm. × 12.5 cm.). Most of the output is sold as railway ties to India's narrow, meter and broad gauge railways, although a small part is destined for structural purposes.

Whereas in East Punjab the timber is extracted by the Forest Department, in Uttar and Himachal Pradesh the standing trees are sold to private contractors bidding at public auctions, in small lots and for extraction within very limited time.

All trees for felling are marked by the various state forest departments in conformity with sound silvicultural principles according to the silvicultural treatments prescribed in the local working plans. The trees are then felled and cut into lengths by hired labor, and hewn and sawn by hand into sleepers, on the spot. Thus conversion takes place near the stump, and no log is ever skidded or otherwise moved to be converted at a central delivery point. Work is only done in the summer months and no use is made of snow in winter for moving either logs or the converted timber, although there are instances of winter logging having been attempted locally.[3] After conversion the sleepers are carried on human back, often for many miles, to the nearest stream, to be floated to a boom at the edge of the plains, some 50 to 150 miles (80 to 240 km.) away. In small streams with little water, elaborate systems of 'telescopic slides' and 'wet slides' are used, but free floating is the practice in the main rivers. It often takes six months or more to reach the boom, where the sleepers are taken on land for sale or are rafted for further transportation across the plains.

This system of timber extraction appears well suited to the kind of conditions that, for a long time, have prevailed in these mountains. Labor is very cheap and the standard of life low. At night, the workers take shelter under a rock or bluff, and they have a simple meal only twice a day. Clothing is far from being adequate for the heavy work, and tools are mostly primitive, consisting of crude, village-made axes, some primitive cross-cut saws, a ripping saw and perhaps a pole for turning a log, if required.

[3] Bakewell, C. Mountain Logging in the Lolab, Kashmir Valley. *Empire Forestry Journal*, Vol. 14, No. 2, 1935, p. 228-232.

Apparently not much, if any, attention has been paid to these labor conditions in the past. The fellers and sawyers are paid by piece work, and nobody seems to be much concerned about how much they produce per day. The workers themselves are not in a position to improve their equipment and techniques, being extremely poor and illiterate.

There can be no doubt but that these traditional methods of timber extraction leave much room for improvement, and there is also no doubt that there will have to be improvements as wages rise in keeping with demands for higher living standards and as more timber is wanted at reasonable prices. Already some lots of mountain timber, although in demand, could not be sold because the market prices offered did not cover the cost of extraction.

No country can now afford to waste half or more of the standing volume of its forests by relying on outmoded logging and extraction methods. The writer estimated that the annual gross income from the forests of the areas which he inspected could be increased by 5 to 10 million rupees (approx. U.S. $1.1 to 2.2 million) per year by introducing economical, efficient and integrated logging operations. At the same time, however, much attention needs to be given to silvicultural considerations. At present regeneration in the mountain forests is frequently endangered by bad land use practices on the part of local populations, and much effort is required to secure sufficient young growth for successful management of the forests on a sustained yield basis.

Yugoslavia

Distinctly different so far as past development is concerned, and yet quite similar with regard to their technical aspects, are the conditions and problems of mountain timber extraction in Yugoslavia.

The forests of Yugoslavia have, in the course of centuries, been reduced by over-cutting, excessive grazing, and lack of skilled care.

The first heavy drains occurred on the Adriatic coast, along the great east-west trade routes, and in the plains of the Danube and its tributaries, where the ruin of large forest areas started hundreds of years ago.

The forest wealth remaining intact, chiefly in the mountainous parts between the coast and the Save river (the alpine parts of Slovenia, the Karst ranges of Croatia, and the Dinarian Alps of Bosnia-Herzegovina and Serbia) attracted foreign enterprises towards the end of the last century and early in the 1900's. Mechanical equipment and, in particular, forest railways were used recklessly to secure as high an output as possible. This heavy exploitation resulted in a further rapid reduction of the total forest resources.

Tremendous sacrifices were again demanded from the forests of Yugoslavia during the first and second world wars, and then for the reconstruction of the country over the last ten years. During this latter period the Yugoslav forests have been drawn on sometimes to the point of exhaustion for re-constructing thousands of homesteads, bridges and railways and, through large exports of rough timber and processed commodities, to bring in foreign monies so much needed for the industrial development of the country.

It is quite obvious that in such periods of national emergency fast mass production of wood at low cost is a necessity, and considerations of careful conservative silviculture have to take second place. This is not an experience by any means peculiar to Yugoslavia.

Today, with the greatest demands of post-war reconstruction overcome and conditions greatly improved, the Yugoslav foresters face the difficult task of reconstituting their shrunken forest resources and of introducing sound, sustained-yield management and intensive care of all forest stands. As most of Yugoslavia's remaining forest resources grow in the rougher, less accessible parts of the country, this in no small part entails attention to careful mountain logging.

Features of Mountain Logging

All work in rough country and at higher elevations is, in one way or another, affected by the natural conditions of accentuated topography and is in many ways, but not all, more difficult to accomplish than in flat low terrain. Moreover, as has already been mentioned, the prime function of mountain forest may be protection and, therefore, mountain logging must be done on a much more conservative basis than in lowland forests.

The difficulties peculiar to mountain logging are partly of an objective nature, partly caused by more subjective, human factors.

Natural difficulties

Difficulties beyond the reach of human control are inherent partly in the geographical location of mountain forests in relation to consumption centers. The products of these forests have, as a rule, to move over considerable distances, frequently over very difficult terrain, through gorges and defiles, to reach their destination. This frequently results in heavy damage, serious losses and high operation costs.

Topographic conditions rate equally as a primary handicap. Rough country, steep slopes, rocky terrain render all work more strenuous, more expensive and more dangerous. Labor conditions and labor organization therefore require special attention. The workers' personal equipment such as shoes and clothing, their food, shelter and accommodation must be of decidedly better quality than is generally necessary in lowland operations.

The forest work must, as a rule, be decentralized and be carried out by relatively small operating crews, which makes supervision difficult and expensive. Travelling distances to remote, often isolated places can be long and access difficult. Therefore the employment of machines and other heavy mechanized equipment is generally limited, and a very great deal of manual labor is still required.

Rough country also means high losses or deterioration of valuable timber in transit when, for instance chuting or floating in mountain ravines have to be used. Quite often only high-grade timber pays for its extraction. Tapping mountain forests, therefore, frequently results in undesirable "creaming" operations, whereby a great deal of wood is left unused in the forest.

Climate in mountainous areas is, as a rule, much more severe than at lower elevations, particularly in winter when snow occurs. Quite often logging operations must periodically be closed down for consider-

able lengths of time due to heavy snow cover and unfavorable winter conditions. Mountain weather is, generally, very unpredictable, with sudden changes, rain and mist, which may suddenly accentuate the difficulties and dangers of the working conditions, apart from resulting in higher exploitation costs.

Subjective factors

Besides, there are difficulties arising for subjective reasons.

Mountain regions are usually less densely populated than most cultivated lowlands, and settlements are much more dispersed. The labor supply is, therefore, limited and hard to concentrate. Lack of communications and rough country are responsible for considerable expenditure of time in moving labor between the villages and working sites.

Again, mountain people are, in general, decidedly conservative and do not take at all easily to new developments. Their attitude towards new ideas is rather one of reluctance, and, in particular, their aptitude for mechanical activity often slight.

Furthermore, because of the relative poverty of their environment, they tend to be insufficiently nourished, clothed and equipped, particularly in the underdeveloped countries of the world.

All this creates a labor situation which militates against the introduction of modern logging methods into remote mountain areas.

Favorable aspects

Mountain forests offer, on the other hand, some distinctly favorable features, of which every advantage should be taken.

First, the forests tend, particularly at higher elevations, to be more or less uniform as to tree species. They consist, as a rule, of one or a few softwood (conifer) species only, which are much in demand throughout the world, for instance for pulp manufacture. This uniformity in composition is of distinct advantage both as regards exploitation and placing the timber on the market.

Moreover, since trees at high elevations grow very slowly and regularly, the technical qualities of their timber are often outstanding, commanding good prices and furnishing suitable raw materials for many special purposes.

Then, the slopes and higher elevations on which the forests grow provide gravity, a very effective motive power free of charge, which can and should be utilized to the greatest extent. In the same sense, other profitable natural features are the relative abundance of water courses useful for transportation, and particularly the occurrence of snow, which offers a most effective and cheap sliding medium for log transportation.

Especially in tropical countries, mountainous regions tend to enjoy a healthier climate than the often fever- and disease-stricken lowlands. From this point of view they can offer much better labor conditions to forest workers.

Again, ownership of remote mountain forests tends to be vested in the State which is one reason why they are on occasion relatively well preserved. State ownership means that plans to introduce large-scale logging operations do not have to face the kind of legal difficulties often presented in more accessible and populated areas where a complicated land ownership pattern is to be found. The agency concerned can, therefore, concentrate on the natural and technical difficulties, which is a considerable advantage.

Organizing Mountain Timber Extraction

There are now no insuperable technical obstacles to executing logging operations satisfactorily even in very difficult hill country. The legitimacy of any such projects lies in economics. It should be recognized, however, that before any work in the forest is permitted, some basic conditions must be fulfilled.

Mountain forests are particularly vulnerable to uncontrolled exploitation, the results of which can be disastrous, as only too many examples have shown. But the erroneous idea still widely persists that hill forests can survive without any artificial assistance and that consequently there is no need for other than nominal expenditure on management and on silvicultural operations.

It is, on the contrary, absolutely essential that exploitation should be based on sound working plans drawn up and agreed beforehand. All cutting must be planned in such a way as to ensure a permanent forest cover, eventual improvement in the cutover stands, and adequate regeneration. To this end the general principle to be adopted should be selective cutting, which method requires sufficient numbers of workers for execution, and of trained foresters for close supervision of operations.

Execution of logging operations [4]

In most cases there can be no question of simply accepting methods, techniques and equipment commonly used in operations in flat, easily accessible forests. Generally the terrain will automatically rule this out. The more difficult the terrain and other natural conditions, the more important becomes the human factor, in other words individual manpower.

The aim in all extraction plans must be to get the utmost possible out of the given natural conditions, particularly through intelligent use of gravity, snow and water.

The solution of the problems of mountain timber extraction has mainly to be sought, first, in a clever application of relatively simple, cheap methods and use of efficient light equipment, turning natural features to the best possible advantage, and, secondly, in an intensive rationalization of working techniques. This will in general lead to greater success than reliance on heavy mechanical equipment, though the latter may have to be employed where the trees to be extracted are of very large size, where manpower is very scarce, or where transportation is required over considerable distances.

Only the best hand tools should be used for felling and cross-cutting, such as have been designed in several countries after scientific research and practical tests.

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[4] Lloyd, A.H. Extraction of Timber by Skyline Crane, *Unasylva*, Vol. VII, No. 4 p. 159.
Koroleff, A. Fundamentals of Logging Steep Slopes, *Unasylva*, Vol, VIII, No. 2, p. 72.

None the less essential are efficient techniques of application and proper maintenance of these tools.

Simple means of moving logs which can be very efficient if properly handled, are pulley blocks and tackle, snubbing winches, wooden chutes or flumes, and particularly sleighs for use on inclined ground and in snow.

For long-distance extraction water is a very efficient and economical means. Flumes of wood, stone or metal help overcome rough river sections where free floating or rafting is impossible.

Depending on circumstances, advantage should be taken of the latest technical developments in light, efficient mechanized equipment of proven reliability, such as certain types of power chain saws; light overhead rigs (skyline-cranes, lasso-cables, etc.); gravity wires and cableways; mobile power winches; snubbing devices, snatch blocks and other cable accessories; portable saw benches (available as band, sash or circular); portable pulpwood splitting machines; portable metal flumes, etc. Proper maintenance of such equipment and the supply of spare parts must of course be organized simultaneously.

In short, it is quite possible to accomplish sometimes astonishing results even with limited human, animal or mechanical power, merely through skilful combinations and improvisations. This demands, however, ingenuity and imagination on the part of executives as well as of individual workers. Particularly in regard to the use of mechanical equipment, success depends on whether it is being employed in the right place and in the right way. Nature must be made the mountain logger's ally, not his foe.

The advantages of logging techniques employing simple means and methods are various:

1. By using a considerable amount of human labor a great part of the operational expenses is being paid out in the form of wages to the local population, thus contributing substantially towards raising standards of living.
2. Capital investment can be kept comparatively low. Moreover, the simple equipment required can often be manufactured within the particular country concerned, a matter of considerable importance in relation to foreign currency balances.
3. Modest technical equipment and uncomplicated working techniques are relatively easy to introduce. Considerable improvements in mountain logging operations can frequently

Simple, but reliable and economical gravity cableway (Donald system) for transportation of handhewn sleepers in the Kulu Valley. Three thin track cables carry the loads, each cable light enough to be transported on human back to places inaccessible by other means of transportation.

be achieved merely through the sympathetic training and education of forest labor, without any great capital expenditure.

In fact, mountain timber extraction is, to a great extent, a problem of man management. The human factor has to receive first consideration, and in this respect, the starting point is similar in all mountain countries, east or west, whether already highly industrialized and mechanized or not. In very rough country, money and the machine soon lose their superiority, and the contest remains chiefly between man and nature. So the working techniques of each individual need to be rationalized to the utmost. But it cannot be expected that improvements in logging are simply a matter of days or months. Unskilled labor cannot learn in weeks what advanced workers in some countries have only acquired through decades of training and tradition. Working efficiency, initiative, ingenuity and imagination can only be induced gradually, step by step, through continuous effort. The process can certainly be accelerated but it still takes time, and all planning should take this into account.

Transportation

What has been said above relates chiefly to the preparation proper of logs in mountain terrain. Somewhat different and frequently more difficult problems are posed by the long-distance transportation of timber from the forests to the main consumption areas, and of labor and supplies to the forest.

For this, waterways are certainly the most economical means but they are not always available nor their use feasible. Logging railways have been used in many countries for over 50 years and they have given outstanding service. But their use in rough mountain terrain is limited both for technical and economic reasons.

Much hope has also been placed in long-distance cableways, and there are many types which have been operating satisfactorily for decades. Despite, however, the outstanding services which can be rendered by cableways, their importance as a universal solution to overcome distance has been fading. Their load capacities are limited and they need a skilled operating crew, while their merits for log transportation tend to be overshadowed by the fact that they induce overexploitation, to pay off the heavy capital investment which they entail. Moreover, the number of possible loading stations is also limited and any tracts between them derive no benefit at all. And most important consideration of all, while other means of transportation have been tremendously developed over the last decades, in the case of long-distance cableways there has been no such revolutionary progress.

There can be no doubt but that *roads* are the best suited means for all-purpose, long-distance transportation in difficult terrain. Apart from their usefulness for forestry, they are an unquestionable requirement for the introduction of larger labor forces and technical equipment to mountain areas, and for the bringing in of regular food and maintenance supplies. Moreover their use is open to all kinds of vehicles, from village-made donkey carts to modern trucks, and thus movement is not restricted to a small number of especially trained skilled workers. They contribute also to the general welfare in the broadest sense by facilitating agriculture, local trades, cottage industries, administration, education, medical care, tourism, and so forth, while their construction and maintenance can largely be carried out by local labor and so provide welcome earnings for the mountain population.

For the forests, access roads result in an immediate and very substantial increase in stumpage values. They are basically important for forest management, supervision, fire protection, and for the introduction of forest industries, particularly to process low-grade forest products in the vicinity of the forest themselves.

In short, roads are essential means to raise forest yields and utilization to the maximum level of sustained production, and to keep it there permanently.

Conclusion

In mountain forest extraction, many specific difficulties and problems, whose solution requires much initiative and enterprise, have to be surmounted. To speed up developments and to increase efficiency, active encouragement is necessary. Governments must either contribute substantially to long-term capital investments, particularly for means of transportation, or help private initiative to do so, by executing an appropriate forest policy.

If government agencies are not in a position to carry out forest exploitation themselves, they should make every effort to make this work attractive for private enterprise. In such cases, however, forest authorities must as far as possible see that adequate investment is made to ensure *permanent* improvements and thus guarantee *sustained yields* from the forests.

Lasting improvements such as trained forest labor, the introduction of efficient equipment, tools and techniques, and construction of permanent means of long-distance transportation, require a consistent official forest policy, both in regard to production and marketing, since the efforts required are of such a magnitude that they can only be undertaken when continuity of forest operations is assured. If not to be carried out by state agencies, mountain timber extraction should be handed over to specialized enterprises on the basis of *long-term contracts*, concession areas being limited preferably by topographical units or watersheds.

The latest FAO inventory of forest resources does not reveal how much of the calculated timber reserves of the world lie in mountainous areas but the proportion must certainly be considerable, and it is time to start putting these unused assets to productive use.

Financing Pulp and Paper Development in Latin America

by FAO Staff

A document prepared for the Latin American Meeting of Experts on the Pulp and Paper Industry, Buenos Aires, Argentina, 18 October - 2 November, 1954.[1]

The problem of financing pulp and paper development in Latin America is part of the larger problem of releasing, securing and channelling investment funds into all branches of the continent's economic activity. The causes and consequences of chronic capital shortage in the less developed regions of the world and, specifically, in Latin America, have been dealt with in innumerable official and private publications in recent years. The present paper makes no attempt to deal with this problem.

The capital shortage, it should be remarked, is a relative one — relative to the tremendous capital needs occasioned by rapid economic development. In point of fact, the rate of investment in Latin American countries is, on the whole, rather high, gross investments amounting to some 16 or 17 percent of gross output. Only a fraction, somewhere between a quarter and a third, currently finds its way into manufacturing industry. Of this fraction, perhaps half represents reinvestment rather than new investment. And pulp and paper is only one of many branches of manufacturing industry in urgent need of development.

It is natural therefore to ask: how urgent is that need? How can the claims of pulp and paper be balanced against competing claims? Answers to these pertinent questions lie outside the scope of this paper, and indeed the answers will vary from country to country. But it is perhaps possible to indicate briefly some of the considerations which have to be taken into account in reaching decisions of this kind.

These considerations are primarily, but not exclusively, economic. They concern national economic policies and the institutions through which those policies are effected, whether they be planning boards, central banks, development corporations or fiscal systems. It may be assumed that, other things being equal, the flow of private investment will be directed into those channels which offer the best prospects of remuneration after taking into account the risks involved. From this standpoint, the prospect of the pulp and paper industry securing the capital it needs would seem to depend entirely on the rate of profit to be expected as compared with those to be looked for in alternative channels of investment.

Other things, however, are far from being equal; indeed it is the essence of planning, whether this consists of the mildest economic interventionism or of comprehensive regulation, that those branches of economic activity the planner considers important should be encouraged.

All the Latin American economies are free enterprise economies. But all Latin American governments are preoccupied, some intensely so, with the problem of ensuring that economic development takes place in an orderly, balanced, programmed fashion; this gives rise to the need:

(*a*) to ascertain development priorities;

(*b*) to take steps to ensure that these priorities are made effective. The means available for making priorities effective are many and varied: state enterprise, state lending, lending by public and semi-public institutions, discriminative taxation, tariff policies, preferential exchange rates, and so forth. The extent to which these various means are employed differs from country to country in Latin America. But it is safe to say that nowhere can governments afford to allow development patterns to be set solely by the investment flows that would correspond to freely competing profit expectations. To attempt to assess the likelihood of pulp and paper ventures obtaining the necessary capital by comparing estimated rates of profit in that industry with those obtainable in other fields would therefore be both naive and fruitless.

Rather we must ask ourselves what are the criteria for deciding what fields of investment a government should sponsor or encourage, and how the pulp and paper industry measures up to these criteria.

Ideally the development priority rating of a particular project would be based on a marginal social productivity assessment. An examination of the availability and location of the physical resources required would be followed by an estimate of the project cost. This would include:

(*a*) fixed capital, distinguishing foreign exchange needs;

(*b*) operating capital; with separate estimates of foreign exchange needs for any materials, fuel and spares that need to be imported, payments to foreign technicians and interest on foreign capital;

[1] Prepared in co-operation with the United Nations Economic Commission for Latin America, Technical Assistance Administration, and the Economic Commission for Europe.

(c) indirect costs not allowed for in the planned project, such as additional power, transport and community facilities. From the gross total should be deducted various cost offsets which, in the main, flow from the indirect costs, e.g. the opening-up of new raw material supplies may permit the development of other industries based on that material or materials found in association with it; by-products, not taken into account in the original project, may enable an associated development to take place; some of the community facilities may have a value not confined to the project, and so forth.

The net cost of the project can now be compared with its contribution to the national income over the expected life of the productive assets. The foreign expenditures involved can be compared with the export-earning or import-saving power over the same period. Both these criteria offer a means of comparing one project with another in economic terms, and thus assessing development priorities.

This is the ideal procedure, but in practice the ideal is seldom attainable:

1. There are usually considerable margins of error attached to even those estimates which at first sight seem capable of fairly exact measurement.
2. It is extremely difficult to measure the indirect costs, and even more difficult to reduce the possible cost offsets to figures.
3. There are considerations which lie outside the economic field which may call for a readjustment of benefit–cost assessment.

Clearly, it would be outside the scope of this paper to attempt to measure the development priority which should be accorded to pulp and paper projects in each Latin American country; only the governments concerned possess all the data permitting such a calculation to be made. It is possible, however, to offer a few observations.

Other papers submitted on this subject contain original data relating to the capital requirements for, and production costs at, hypothetical mills to be established in various parts of Latin America. *These models enable us to form an idea of the orders of magnitude involved.* One conclusion which may be drawn is that about 50 percent of the total capital required will normally have to be spent abroad. This sets a lower limit to the foreign exchange needs for servicing foreign capital, since foreign capital may also be sought to meet locally incurred capital costs.

Let us consider, for example, one of the hypothetical mills which has been the subject of pre-conference study, a 30,000 ton annual capacity pulp mill to manufacture unbleached sulphate pulp from mixed tropical woods in the Yucatán region. It is estimated that to establish this mill a total capital would be required of US $14 million. This would cover land, buildings, the cost of mill machinery and of erecting the mill, investment in the forest, the provision of housing and community facilities, capital costs during the erection period and working capital. Foreign capital would perhaps be obtained for about half the total amount, say US $7 million. Now capital charge[illegible] sheet shows, amount to US $43 per ton of [illegible] The capital 'import content' will probably be les[illegible] half this amount, since foreign capital will probably be at a lower rate of interest, covering machinery purchase; let us say US $20.

Actually, this US $43 is not the whole of the capital charge, since the capital costs on the forest operations are separately included in the pulpwood cost, of just under US $20 per ton. A part of this is for equipment which will be purchased abroad; let us assume that US $7 of the unit pulpwood cost represents service on foreign capital. This gives us a total capital 'import content' of US $27 in the cost of production per ton. None of the cost components other than capital charges call for substantial foreign expenditures. In this instance all the chemicals will be obtained locally. Let us assume that clothing, felts, wires, etc. (US $2 per ton) are purchased abroad, all repair and maintenance material (US $3) likewise, and take into account half (US $2) of the contingency item. This gives us a total import content of US $34 of the cost of production per ton. Comparing this with the c.i.f. cost of unbleached sulphate pulp we see that there is an import saving of US $100-110 per ton, and an annual saving of around US $3 million. If we reckon the life of the assets at 10-15 years, this means an aggregate saving over that period of US $30 to 45 million.

If we take another example, a 60,000 ton integrated paper mill at Amapá, Brazil, costing around US $40 million, would have an import content (capital and other items) in its mill cost per ton of about US $80-100. This, at current prices, corresponds to an import saving of about US $100 per ton, or US $6 million annually.

These examples give a very rough indication of the import-saving value of new pulp and paper projects. If a bigger proportion of the capital were raised abroad, including some risk capital requiring a higher return, the import saving would diminish. Since the cost estimates allow for only a conventional rate of profit (12 percent) on investment capital, a part of any additional profit obtained would also have to be repatriated.

Nevertheless, the figures just quoted suggest that pulp and paper projects will have a considerable import-saving value. It is not possible, of course, to say how this value compares with that which might be expected in other investment fields. And in any case, one must beware of setting too much store on the import-saving power of pulp and paper investment. The experience of pulp and paper development in Latin America over the last two or three decades suggests that the main effect of new indigenous production is not to replace imports but to enable latent, hitherto frustrated, demand to become effective. With limited foreign exchange resources available, the tendency is increasingly to give more and more priority to capital equipment items in total import programs. This may operate through quotas, setting quantitative or value limits to the volume of paper which may be imported, or through tariffs, allowing prices to damp down effective demand. In other words, pulp and paper imports are already below the level that would correspond to a full and free satisfaction of internal demand. Thus the establishment of a new pulp and paper project will not necessarily lead to a commensurate reduction in pulp and paper imports;

rather it will admit of local paper consumption standards rising to a level more appropriate to the stage of economic and cultural development reached in the country. This, of course, is a real gain which must be taken into account. Governments embarked on campaigns to reduce illiteracy and raise educational standards will not be oblivious to this fact.

The establishment of a new or enhanced local paper supply can permit many other developments to take place. For example, it may facilitate the setting-up of a local book-publishing industry, with all its cultural implications, of bag, carton, cardboard box, manufactured stationery, and various other paper-converting industries, which did not exist before.

It may open up new possibilities in wood-using industries. There is a general impression that the key to opening up the mixed tropical forests for exploitation lies in integrating the activities of appropriate groups of wood-using industries — pulp and paper mills, plywood and sawmills, fiberboard mills, — so that some of the heavy development costs can be spread. This view is not borne out by the investigations which have preceded this meeting, and in all the calculations which have been made it has been considered safer to make the pulp and paper estimates independent of other forest product enterprises; not, however, independent of all other developments since sites have been located so as to take advantage of impending developments in other fields. This procedure has been dictated partly by the technical difficulties of planning other elements of an integrated group of industries, partly because the investment costs in pulp and paper heavily outweigh those which may be envisaged in the other industries. In consequence, many of the items that appear as charges in the pulp and paper calculations will contribute to lowering the capital cost of subsequent developments in other wood-using industries.

The size of the problem

It is now pertinent to indicate, in very general terms, the size of the problem involved — the investment which is likely to be necessary if the rise in the continent's paper needs over the next few years is to be met from the continent's own resources — it having been established that particularly favorable conditions exist for the development of pulp and paper industries in many Latin American countries, and that, in view of prospective world supply conditions, such a development of indigenous production will be necessary if paper consumption in these countries is to increase at a reasonable rate. A development of indigenous production of pulp and paper on the scale required will require heavy investment. It is impossible to give any very precise figures since, as is made clear in Table 1, so much depends on the scale of operations and on the kind of mills that go to make up that development.

However, by making reasonable assumptions as to the probable size of future projects and as to the proportion of them which will be established as integrated projects, it is possible to arrive at the following approximate figures:

TABLE 1. – CAPITAL REQUIREMENTS FOR SELECTED PULP AND PAPER MILLS OF VARIOUS TYPES AND SIZES
(*Millions of US dollars*)

Capacity (thousand tons annually)	Newsprint mill[1]	Sulphate pulp mill (bleached)	Integrated paper mill (bleached)	Non-integrated paper mill
15	—	13	17	8
30	17	18	24	11.5
60	25	27	38	18
90	32	35	53	—

[1] Newsprint, United States. All others, Yucatán model.

TABLE 2. – CAPITAL REQUIREMENTS OF A LATIN AMERICAN PULP AND PAPER PROGRAM

Capacity	Program				Capital requirements in *million US $*
	Newsprint	Other paper and board	Mechanical pulp	Chemical pulp	
	...thousand metric tons annual capacity...				
Total 1950 – 65 capacity additions, if all realized: (includes capacity completed since 1950 or presently under construction, and all other projects in sight, ranging from advanced planning stage to preliminary study)	140	465	190	580	515
Further capacity required over and above the foregoing totals: assuming that pulp and paper imports will be maintained:					
(*a*) given only minimum economic growth	220	375	255	35	220
(*b*) given favorable economic development	435	1 000	525	445	800

Thus present plans, very freely construed, imply a total investment of US $515 million over the period 1950-1965, or an annual investment of about US $35 million. The amount of investment that would be required over that period, assuming that only minimum economic growth is realized, to assure a reasonable standard of paper consumption without incurring an increased burden of imports, is around US $ 750 million, about US $ 50 million annually. If a more favorable economic development takes place, then over US $ 1,300 million investment would be required, or about US $90 million each year.

These figures would cover the construction and equipment of the industrial plants themselves, the necessary forest investment, and most, though probably not all, of the concomitant heavy investments for power capacity.

For a realistic discussion of the potentialities for paper and pulp development in Latin America, the question of the supply of capital must therefore be taken into consideration. The purpose of the present paper is not to propose specific solutions, but merely to supply some factual background information for a consideration of the general problem of financing.

The rate of investment in Latin American countries is, on the whole, rather high. Gross investments amount to some 16 or 17 percent of gross output, or about US $ 7,000 million (at 1950 prices).[2] Out of this total, something between 25 and 35 percent, say US $ 2,000 million, may be in manufacturing industry. Thus the direct capital requirements for new paper and pulp capacity on the scale mentioned above, might represent around an additional 5 percent of total industrial investment in Latin America.

At first sight, this figure may appear to be modest. But it must be remembered that this would be the figure for gross investment in manufacturing, and that replacement investment is a sizeable proportion of the total. Furthermore, a large part of the remaining net capital formation represents self-financed additions to the capital of existing industries. Since we are considering mainly the financing of new industrial plants, the relevant figure with which to compare the annual requirement of US $ 50 to 90 million would be the amount of capital annually channelled to industry in the form of bank loans or long-term capital raised on the capital market. No reliable figures are available for such a comparison, but it can safely be assumed that, on this basis, the capital requirements for the desirable development of the paper and pulp industries would appear to represent a very considerable addition to the demand for capital from internal sources.

Before considering the various possible sources of finance, it may be as well to enumerate the main purposes which the capital raised will have to serve. Here we can only generalize, but a typical case might show that around 40 percent of the total is needed for the purchase of machinery abroad, another 3 percent for foreign technical skill (engineering and other consultancy fees, etc.), 10-15 percent for forest investment (including housing, but excluding equipment, already included in the preceding figure for machinery), 30-35 percent for buildings and such local capital costs as community facilities and transport, and 8 percent for working capital. These figures reflect the investment pattern for a 60,000—ton pulp mill in an undeveloped area. They would vary from site to site, and with mill size. For an integrated paper mill, a higher proportion of the total would be required for machinery, perhaps up to 50 percent, and a lower proportion for forest investment and other headings.

Normally one would expect that domestic capital would be forthcoming to cover at least the locally incurred items, and some of these (forest investment, community facilities, transport and the like) are of the kind that should encourage public loans at reasonable rates of interest, since they constitute development expenditure in its wider sense.

Sources of capital

Domestic capital may be forthcoming either from the state itself or from private investors. The state has, of course, means of encouraging private investors.

[2] ECLA *Economic Survey of Latin America*, 1951-52, p. 89. Conditions were more favorable at that time than they are today. The current proportion is probably no more than 14 percent.

The degree of state participation in i[illegible] widely between the different countries, alt[illegible] seems to be a tendency in most Latin American c[illegible]tries towards direct state action. Argentina is about to enter on its second five-year plan, and in a number of other countries many projects are being carried out by state development corporations, either of a comprehensive kind or formed to deal with a particular supply difficulty. Of the other larger countries, Mexico is the one in which there is the greatest degree of state participation in investment. In every year between 1944 and 1952, the proportion of total investment accounted for by government expenditure has been between 40 and 50 percent.[3]

Except in one or two cases, in the past, pulp and paper making have not figured in the first rank of industries to be developed by government initiative in non-industrialized countries. Other and more basic industries have usually been considered to have a prior claim, either because they have been thought to hold a key position in a balanced program of development, or because they have been considered to be capable of replacing more, or more essential, imports.

Nevertheless, in Argentina, Brazil and Mexico, the governments all plan direct large-scale expansion of the pulp and paper industries. These countries, in addition to being the ones with the most comprehensive government development plans, are the ones which offer the largest markets for paper at the present time, for Argentina, Brazil, Chile and Mexico are the only countries with significant book-publishing industries.

A number of other Latin American governments, while they may not as yet have embarked on any specific investments in this field, are also known to be closely interested. The alacrity with which they have solicited the despatch of survey missions under the Expanded Technical Assistance Program, and the close attention they have given to the resultant reports, bespeak a more than academic interest.

It is, in fact, becoming increasingly recognized that for a variety of reasons investment in pulp and paper should not be accorded a low priority. Thus while each government will inevitably have to decide its own priorities itself, in accordance with the total economic situation confronting it, the coming years will probably bring rather more government interest than has been displayed in the past, both in the shape of direct government investment (or investment by quasi-government institutions) and in encouragement offered to private investors.

The practical difficulties of channelling personal savings to investment in manufacturing industry have been found to be very great in Latin America. Although capital markets exist in some of the larger countries, their scope is limited. Only in Argentina is the volume of security transactions appreciable in relation to income and investment.

In the absence of well-developed capital markets, internal financing of private investment has to rely to a large extent on self-financing by enterprises, the most direct form of application of savings for investment purposes, on group subscriptions or on bank loans. As far as self-financing is concerned, although it is

[3] ECLA *Economic Survey of Latin America*, 1951-1952, p. 89.

of great importance in many countries, it is by definition not a means of developing a new industry, and although it will undoubtedly have its part to play in any pulp and paper program, it is certainly not capable of supporting expansion of a small industry on the scale envisaged.

Hitherto much of the financing, from domestic resources, of new industrial enterprise has been in the form of credits from private banks, special investment banks, or, in some cases, even from central banks. So far as the commercial banks are concerned, rates of interest are high, as is to be expected, while many of the loans are only of short term with the necessity of frequent renewal. Generally speaking, it seems unlikely that new pulp and paper mills will be able to rely on them for more than their working capital which, as we have seen, accounts for but one-tenth or less of the total capital required.

The absence of large and well-organized capital markets, however, by no means implies that the possibility of raising private capital for new industrial investment is negligible. Private capital does exist, and can be mobilized, without necessarily passing through agencies and institutions typical of countries in a more advanced stage of development. And in recent years a number of large-scale industrial ventures, calling for large capital investments, have been financed by domestic private capital, sometimes with the participation of government financial institutions, in a variety of ways, including private subscription.

This means that there is a considerable reserve of private capital which can be tapped for new pulp and paper ventures, providing ways and means of mobilizing it can be found. And indeed this is what one might expect in countries where the need for modern and well-organized financial institutions has not yet been strongly felt. It is customary to lay emphasis on the low level of *per capita* savings in the less developed countries. It is often overlooked that here an average figure tells far less of the whole story than in advanced countries, for both the income and capital frequency curves are much steeper, the contrasts in wealth much sharper. A corollary of this is that the possibility of raising capital by concentrating on a relatively narrow band of higher incomes is much greater.

Loans from the International Bank or the United States Export-Import Bank constitute the main sources of official foreign long-term capital. To secure these loans, projects have to fulfil relatively severe criteria of necessity for economic development. Out of more than 100 credits to Latin America authorized by the Export-Import Bank between the beginning of 1946 and the middle of 1953, two were for machine tools and industrial equipment, two for textile machinery and one for a plastic material factory. In addition, there were a few for chemical plants and heavy industry, but almost three-quarters were for the development of electric power, transport systems or mining and metal processing. In the value of credits authorized, the preponderance of these three groups was even greater.[4] The loans granted to Latin American countries by the International Bank for Reconstruction and Development have been overwhelmingly for the construction of power plants. However, there has been recently one important loan by the International Bank for the development of a pulp and paper project in Latin America — US $20 million to Chile — and the possibility of others must not be ruled out. A pointer, if needed is to be found in the reports of the general survey missions despatched to various countries by the International Bank at the request of Member Governments. The object of these missions is to make recommendations for long-term development programs after evaluating, in the light of the overall economic situation, the relative claims of the various sectors of the economy, and the fields within each sector, for priority in investment. Most of these missions have reported insufficient utilization of forest resources and envisaged a place for pulp and paper making in a balanced forest program. Where specific recommendations have not been made by the missions, it has usually been because of lack of industrial experience relating to the pulpability of non-traditional materials. One might suppose, therefore, that a soundly based, well-prepared scheme for pulp and paper, integrated into a balanced general program of economic development, would, if submitted to the International Bank along with a request for a loan, receive very careful consideration.

It is well-known that, since the war, the principal international flows of private capital have been from the United States to Canada and Latin America and from the United Kingdom to the sterling area. United States direct net private investments in Latin America were US $1,562 million in the period 1950-53, of which US $858 million represented reinvestment by American interests (see Table 3).

Unfortunately, there is an obvious tendency for these funds to flow into particular countries and industries. Thus, of the US $1.4 billion of 'new' investment in the years 1946 to 1950, more than US $600 million went to Venezuela and a further US $180 million to Brazil, no other country receiving more than US $100 million. Almost 90 percent of the money going into Venezuela and two-thirds of the total to Latin America went into the petroleum industry, while manufacturing industry received less than 10 percent (though about 20 percent of reinvestments are included). More recently, however, the proportion going to manufacturing industry has been increasing; in the years 1951-52 it represented about a third of the total, both for 'new' investment and reinvestment. But the only two countries which received considerable amounts of capital for manufacturing industry were Brazil and Mexico.

In a recent United Nations report, prepared for the Economic and Social Council, on the International Flow of Private Capital,[5] it is pointed out, in the discussion of the movement of capital for the development of manufacturing industry,[6] that these two countries, together with Argentina, where there had been considerable investments in earlier periods, are the ones which offer a market large enough to make profitable the mass production methods for which foreign capital is needed.

This observation is not, of course, directly pertinent to the pulp and paper industry, which is a highly mecha-

[4] Export-Import Bank of Washington — 16th Semi-annual Report to Congress.

[5] The International Flow of Private Capital, New York, 1954.

[6] *Op. cit.*, page 49.

TABLE 3. – NET UNITED STATES DIRECT INVESTMENT (A) AND REINVESTED EARNINGS (B) IN LATIN AMERICA, BY INDUSTRIES [1]

		1946-49 [2]	1950	1951	1952	1953
		..... millions of U.S. dollars				
Manufacturing	A	90	64	116	80	..
	B	233	49	96	94	..
Trade	A	93	18	38	11	..
	B	46	12	23	30	..
Agriculture	A	25	—7	22	—4	..
	B	90	14	15	11	..
Mining & Smelting	A	65	29	60	120	..
	B	10	4	48	15	..
Petroleum	A	748	—62	—31	79	..
	B	106	10	75	137	..
Public Utilities	A	—43	—3	—7	21	..
	B	58	9	10	11	..
Miscellaneous	A	63	7	11	18	..
	B	23	7	9	8	..
ALL INDUSTRIES	A	1 027 [3]	47	209	324	93
	B	535 [3]	105	276	305	172

[1] Net capital movements exclude ship sales to United States-controlled foreign operators.
[2] Figures not strictly comparable with subsequent years, since they have not been revised according to the 1950 United States Census of foreign investment.
[3] Total does not add up to the sum of the parts due to later revision of the former.

nized industry once it has moved out of the handicraft stage. A more relevant consideration is whether the size of the domestic market will enable mill operations to be carried out on a scale that is economic in relation to alternative supply sources. Determining the economic size of a plant in Latin America is no easy matter – some of the complexities are dealt with in Secretariat Paper 3.03. But generally speaking it can be said that already there are at least ten, and perhaps more, domestic markets in Latin America capable of sustaining pulp and paper production in economically-sized mills, and increasing demand in the coming years will probably add another half dozen to the list.

Hitherto, however, it would seem (judging from the scant evidence available on this point) that little or no 'abstract' private foreign capital has found its way into the pulp and paper field in Latin America. There are two main reasons for this. Pulp and paper has not offered returns as attractive as those in, for example, oil and mining; and this field is so specialized that it has not engaged the attention of the private foreign investor.

Nor can it be expected that the situation will undergo any significant change in the near future. But there is a possibility that 'particular' private [illegible] arising in pulp and paper industries in other parts of the world, may seek outlets in Latin America [illegible] particular industrial field with which it is technically familiar. Two different considerations could bring this about. Firstly, there may be some industries, particularly in Europe, which, by reason of either market limitations, home or foreign, or of increasingly stringent raw material supplies, are denied opportunities of reinvesting in their own country; it would be logical for them to seek outlets in their own field abroad. Secondly, a number of well-established paper industries in countries lacking pulpable resources and depending on imported pulp are becoming increasingly anxious about the prospects of securing the increasing amounts of pulp they will require in the future from their traditional sources of pulp supply. This may well lead them to take an interest in assisting the development of new sources of pulp supply. This is by no means as far-fetched as it sounds. German capital is already helping to develop in Chile the production of rayon pulp, partly for export to the important West German rayon industry. A similar development for the West European paper industry could well attend any initial successes experienced in the exploitation of Latin American tropical woods for pulp.

In fact, referring again to the report just quoted, mention is made in the same section of one leading characteristic of investment in manufacturing industry which bears on the present problem, namely, that much of the capital investment is of the most direct kind, i. e. the setting-up of subsidiaries in Latin America by firms established in the more industrialized countries. Not all that is said in the report is strictly applicable to the case of the pulp and paper industry, but this solution is obviously a simple one if it can be reached. It simplifies the problems of the authorization of the import of machines, of obtaining the technical assistance and of the possibilities that, at the earliest stages at least, production would not be at strictly competitive prices. On the other hand, it must not be overlooked that direct investment of this kind involves the country concerned in capital servicing costs which may, under certain circumstances, impose a strain on the balance of payments situation. [7]

Capital flows from Europe to Latin America in the form of direct participation or through the setting-up of subsidiary branches of European industrial establishments, have been very small in recent years. It deserves to be mentioned, however, that in a very recent Franco-Brazilian Agreement, dated 24 April 1954, the French Government, amongst other things, declares its willingness to authorize French enterprises to participate in Brazilian firms or to install branches on their own account in Brazil. [8]

Commercial credits

One other important form of external assistance deserves special mention – credits extended by foreign suppliers of equipment for pulp and paper making.

[7] Many countries, especially Argentina, used up a large part of the foreign balances accumulated during the war in re-purchase of foreign-owned assets.
[8] See *Moniteur Officiel du Commerce et de l'Industrie*, No. 1609, p. 1417.

TABLE 4. – EXPORTS OF PAPER AND PULP-MAKING MACHINERY

Country of origin	1938		1950		1951		1952		1953	
	TOTAL	of which to Latin America	TOTAL	of which to Latin America	TOTAL	of which to Latin America	TOTAL	of which to Latin America	TOTAL	of which to Latin America
	thousands of current dollars, f.o.b.									
United Kingdom	3 565	–	5 838	456	5 799	655	8 971	1 073	11 514	733
Western Germany	[1]6 277	[1]861	2 797	57	8 130	564	16 858	772	19 556	2 416
Belgium-Luxembourg	..	..	293	–	387	–	850	15	1 105	258
France[2]	178	65	1 087	113	1 201	192	1 273	290	..	..
Italy	22	2	375	189	1 048	252	2 061	1 092	1 263	787
Austria	[3]398	[3]3	49	–	11	11	863	4	2 644	14
Sweden	1 400	8	3 812	371	4 001	277	4 525	149	3 902	518
Finland	..	..	–	..	2 028	44	2 087	..	..	..
TOTAL (of European countries listed)	[4]11 840	[4]936	14 251	1 186	22 605	1 995	37 488	3 395	[5]39 984	[5]4 726
United States	1 079	334	14 411	1 572	12 982	3 320	18 042	3 811	11 900	2 264
Canada	–	–	1 098	31	1 059	7	915	69	595	44
TOTAL (of all countries listed)	[4]12 919	[4]1 270	29 760	2 789	36 646	5 322	56 445	7 275	[5]52 479	[5]7 034

Source: National Trade Statistics.
[1] Whole of Germany.
[2] Including machines and parts for working wood pulp, paper and cardboard.
[3] 1937.
[4] Excluding Belgium-Luxembourg.
[5] Excluding France and Finland.
NOTE: Further details of trade in pulp and paper-making equipment are given in Tables 5 and 6.

This can be of considerable importance since, as we have seen, machinery costs represent about 40 percent of total capital requirements, on average. The proportion could fall as low as 30 or 35 percent, but in the case of an integrated paper mill it might well rise to over 50 percent.

Table 4 shows the value of exports in recent years of pulp and paper-making machinery from the United States, Canada and the leading European exporting countries to Latin America. It can be seen that, before the war, by far the greater part of these exports was supplied by Europe. In the post-war years the United States has been the largest supplier, although recently the share of Europe, and particularly of Western Germany, has increased considerably. In 1953, more than one-third of the total Latin American imports of pulp and paper-making machinery originated in Western Germany. More detailed information, by individual countries of origin and destination, is given in Tables 5 and 6.

In the period of acute shortage in the first post-war years, exporters of industrial equipment were in a position to demand pre-payment of part of the price and payment of the rest at the time of shipment or shortly after. But those times are now past, and the last few years have seen a renewal and strengthening of the pre-war trend towards the provision of fairly long export credits by the exporters of capital goods.

This trend is not difficult to explain. With the freezing of the free international flow of long-term capital after the first world war and, at the same time, the tendency for more vigorous investment policies in the less developed countries, the problem of capital shortage has become acute almost everywhere, and not least in Latin American countries.

From the point of view of government policy, in the less developed countries, the possibility of importing equipment on some years' credit gives some relief, provided that the investment in question can within a short span of years contribute to improve the balance of payments, through saved imports or increased exports.[9] From the point of view of the private investor in the less developed countries, this kind of commodity credit is often an essential condition for his investment being at all possible, because internal credit cannot be had in sufficient amount, or only at interest rates which may be so high as to be prohibitive. In any case, interest rates are likely to be higher than those which would eventually be charged in the country exporting the equipment.

For the exporting country, on the other hand, the granting of favorable terms of payment has increasingly become a weapon in the competition for export markets. The possibilities of the exporting firm (or its bank) to take upon themselves the additional financial burden (including the risk) of such credits, is, however,

[9] Failing this assumption, such commercial credits would, of course, mean only a postponement of balance of payments difficulties.

TABLE 5. – IMPORTS OF PULP AND PAPER-MAKING EQUIPMENT FROM SELECTED COUNTRIES[1] INTO LATIN AMERICA

Country	1938	1950	1951	1952	1953[2]
	... thousands of current dollars, f.o.b. ...				
Argentina	250	1 011	582	266	111
Bolivia	–	—	1	—	—
Brazil	73	803	1 951	3 212	4 670
Chile	310	62	141	104	131
Colombia	42	6	601	813	52
Costa Rica	–	125	56	60	4
Cuba	269	211	92	29	72
Dominican Republic	1	—	13	—	
Ecuador	–	–	–	57	
Guatemala		11	11		
Haiti	–	20	–	–	
Honduras	–	–	—	—	—
Mexico	21	389	1 545	2 041	1 517
Nicaragua	—	—	–	—	—
Panama	–	–	–	—	—
Paraguay	—	–	70	—	11
Peru	268	29	94	139	189
Salvador	—	1	—	12	2
Uruguay	34	94	103	522	205
Venezuela	2	27	62	20	80
TOTAL, Latin America	1 270	2 789	5 322	7 275	7 034

Source: National Trade Statistics.
[1] Germany, Belgium-Luxembourg, France, Italy, Austria, Sweden, Finland, United States and Canada, United Kingdom.
[2] Figures for France and Finland are not available for 1953.

very limited in most cases. Therefore, special banking facilities for the provision of export credits[10] have been instituted in most of the major exporting countries.

The present trend is for such export credit arrangements to be given more scope, and this is to be welcomed as a *pis aller*, since it does amount to at least a modest flow of capital from the highly industrialized to the less developed countries, although it must be emphasized that it would be more desirable to have this kind of credit supplied by one or more agencies specialized in the granting of international medium-term credits, and having the exporters compete for markets through low prices and high quality, rather than through generous credit facilities.

Although Denmark is of little importance as an exporter of pulp and paper-making machinery, a recent official report on the question of export credits may be mentioned as symptomatic of present thinking in these matters in European countries. The report recommends government credits in favor of importing countries other than the Organisation for European Economic Co-operation (OEEC) countries.[11] Eastern Europe, Spain and a number of Latin American countries are mentioned as some for which such credits might be made available, and it is explicitly said that "in the case of a fall in business activity in Denmark, it might prove desirable to combat the depression through an expansion of such credits for exports rather than through an expansion of credits for public works or similar traditional weapons."[12]

Hitherto German, Italian and French firms have been more disposed to grant long-term credits than, for example, their United States or British counterparts, but symptomatic of new thinking in the latter countries are the views expressed by Senator Homer E. Capehart, Chairman of the United States Senate Committee on Banking and Currency, on his return from an extended investigatory tour of Latin America.[13] A Bill promoted by the Senator, already voted by the Senate, would restore the status of the Export-Import Bank as an independent agency and enable it to expand its operations. It is hoped that, if this Bill becomes law, the Bank will find a means of satisfying the needs of the export community as regards the long-term financing of capital goods export sales.

Conclusions

Assuming that the economies of Latin American countries develop favorably in the coming years, then the expansion of the pulp and paper industry by 1965 to the point where it is capable of satisfying reasonable demands for paper, without incurring an import burden higher than that of today, would call for an annual investment of around US $90 million over the period 1950-1965. Should economic growth be limited to a bare minimum rate, an annual investment of US $50 million would suffice.

The realization of all present plans for expanding capacity, including those at a very early stage of study, would imply an annual investment over the period of US $35 million. The rate of investment currently and in recent years seems to have been at or near this figure.

The considerable amounts of capital involved prompt the question: What priority should pulp and paper be accorded in a balanced development program? This question can only be answered in the light of the special circumstances confronting each national economic programming authority. Its claim at first sight is not high. It is not a basic industry. Though import-saving, it is probably less so than some other manufacturing industries. A pulp or paper mill, by itself, requires little labor in relation to the capital employed. Usually, however, a pulp or paper project will be accompanied by forest investment and development. This requires considerably more labor. It opens up possibilities of developing other wood-using and associated industries. It creates a new nucleus for industrial development. It may form part of a co-ordinated program

[10] And special arrangements for export credit guarantees.

[11] As for exports to the OEEC countries, such credits would presumably not be compatible with the rules of non-discrimination to which the member countries have pledged themselves.

[12] See *Finanstidende*, Copenhagen, 11 June 1954, p. 1094.

[13] Reported in *Export Trade and Shipper*, 19 July 1954, p. 9.

TABLE 6. – IMPORTS OF PULP AND PAPER-MAKING EQUIPMENT FROM SELECTED COUNTRIES IN 1952

Importing countries \ Exporting countries	United Kingdom	Western Germany	Belgium Luxembourg	France	Italy	Austria	Sweden	Finland	TOTAL OF EUROPEAN COUNTRIES LISTED	Canada	United States	TOTAL OF COUNTRIES LISTED
	thousands of current dollars, f.o.b.											
Argentina	20	56	—	—	—	—	100	—	176	—	90	266
Bolivia	—	—	—	—	—	—	—	—	—	—	—	—
Brazil	879	376	15	290	477	4	21	—	2 062	68	1 082	3 212
Chile	35	57	—	—	—	—	—	—	92	—	12	104
Colombia	1	—	—	—	—	—	—	—	1	—	812	813
Costa Rica	55	—	—	—	—	—	—	—	55	—	5	60
Cuba	—	—	—	—	—	—	—	—	—	—	29	29
Dominican Republic	—	—	—	—	—	—	—	—	—	—		—
Ecuador	—	—	—	—	57	—	—	—	57	—	—	57
Guatemala	—	—	—	—	—	—	—	—	—	—	—	
Haiti	—	—	—	—								
Honduras	—											
Mexico	81	171			558		7		817	1	1 223	2 041
Nicaragua	—											
Panama	—											
Paraguay	—											
Peru	1						12		13		126	139
Salvador	—										12	12
Uruguay	1	112					9		122		400	522
Venezuela	—										20	20
TOTALS, Latin America	1 073	772	15	290	1 092	4	149		3 395	69	3 811	7 275
Western Europe, United States, Canada	4 888	12 595	271	633	686	111	1 651	419	21 254	753	12 628	34 635
Rest of World	3 010	3 491	564	350	283	748	2 725	1 668	12 839	93	1 603	14 535
WORLD TOTALS 1952	8 971	16 858	850	1 273	2 061	863	4 525	2 087	37 488	915	18 042	56 445
1953	11 514	19 556	1 105	732	1 263	2 644	3 902	..	40 716	595	11 900	53 211

Source: National Trade Statistics.
NOTE: Swiss exports of paper-making machinery cannot be distinguished from other types of machinery.

of resources utilization. In addition, an enhanced domestic production of paper makes possible the development of many varied paper-converting industries with important labor-employing and import-saving possibilities. Finally, there are powerful non-economic reasons why domestic production of paper should be increased.

For these reasons the interest of Latin American governments in promoting pulp and paper investment may be expected to increase. This may take the form either of direct investment or of assistance and encouragement given to private investors. For the same reasons it should prove possible to secure additional amounts of foreign official capital. An influx of foreign private capital could be encouraged by appropriate action on the part of Latin governments: one form this might take is the setting-up of Latin American subsidiaries of overseas concerns.

Machinery costs represent the biggest item in total investment, and the supply of foreign equipment on favorable long-term credit terms can make a very important contribution to Latin American pulp and paper development. Nevertheless, an annual investment over the period of US $90 million implying well over US $100 million a year during the next 11 years is a target which is bound to prove difficult, and perhaps impossible, to realize. Since a wide margin of failure would entail a serious lag in paper consumption standards, hampering both material and cultural progress, conscious efforts on the part of Latin American governments seem to be required.

The foregoing paper, together with others bearing on the same topic, was discussed at the Buenos Aires conference. A drafting committee, composed of experts from

Argentina, Brazil, France, Mexico and the United States, under the chairmanship of Mr. Stacy May (United States), prepared a report on this item of the agenda which was subsequently adopted by a plenary meeting. The complete text will appear in the report of the Buenos Aires meeting, which will be published shortly, but the final paragraphs may be quoted here:

1. *An expansion of the pulp and paper industry in Latin America is vitally necessary. There is every indication that well-placed investment in this field will prove profitable.*
2. *For a variety of reasons, this industry is one in which joint investment of domestic and foreign capital offers advantages over what can be achieved by either operating alone.*
3. *To ensure this needed industrial development it is necessary to stimulate the flow of domestic capital in a measure which will at least cover locally-incurred investment costs, working capital requirements and the requisite down-payment on foreign equipment. There is a similar need to encourage a flow of foreign capital to finance the purchase of equipment and the contracting for those technical services that must come from abroad.*
4. *Various forms of financing this development exist, including long-term loans by international financing agencies, medium-term credits for machinery purchases and direct investment by both local and foreign capital. Projects must be carefully drawn up to establish that they are sound business risks and that the climate for investment in the intended area is favorable.*
5. *It is considered that the attention of Latin American governments should be drawn to the special part which pulp and paper industries can play in general economic and cultural [illegible] therefore the desirability of:*
   (*a*) *according priority to these in[illegible] establishing development plans.*
   (*b*) *ensuring that these plans are [illegible] drawn and documented to set forth [illegible] order of feasibility of potential projects [illegible] terms of their respective prospects for fulfilling, in the most effective and economic manner, the needs of Latin America as a whole and its several Republics;*
   (*c*) *mobilizing domestic capital and facilitating the movement of international capital in order to realize this expansion.*
6. *Because an adequate and sustained raw material supply is basic to the industrial development contemplated, the meeting considered that Latin American governments should take steps to establish or improve credit terms for forestry as well as for industrialization.*
7. *Certain developments would involve "settlement" costs so high as to inhibit private investment if charged as capital costs on the paper operations. The meeting considered that in those cases where developments of this kind are deemed to be in the national interest public authorities should provide basic community services.*
8. *The meeting expressed the hope that the conclusions of this meeting would be made known to those banks and financial institutions likely to be interested, so that the attention of those concerned in countries outside Latin America be drawn to the desirability of taking all the necessary measures to:*
   (*a*) *facilitate the financing of equipment sales;*
   (*b*) *facilitate the export of private capital.*

The photographs show (left) debarked poplar logs before being fed to the grinder house of a pulp mill in Zarate, Argentina; (right) radiata pine logs for pulping in a mill at Puente Alto, Chile. (Photographs by G. Welsh).

Commodity Report

Wood Pulp

This report, unlike the last to appear in Unasylva *Vol. VII, No. 3), does not deal analytically and in detail with the wood pulp market. The course of events from end-1952 to mid-1954 was outlined in the article "Forest Products, 1951-1954" in* Unasylva *Vol. VIII, No. 4. After singling out some of the main features of world production and trade in 1954, this article poses the question: what is the nature of the world pulp and paper problem today? The point is dereloped as it concerns Latin America and an assessment is given of the contribution made by the recent Latin American Meeting of Pulp and Paper Experts towards the solution of the problems of that region.*

Events of 1954 have confirmed that in 1953 the long-term upward trend in world demand for pulp products resserted itself. Recovery from the 1950-52 cycle has been complete, and the preliminary figures available indicate that 1954 will prove to have been a record year for production, consumption and trade in wood pulp. The upward trend has been general, though it has not everywhere proceeded at the same pace. Moreover the year has been marked, on the whole, by a satisfactory stability in prices. For 1955, the prospects are no less favorable.

Industrial production in Western Europe rose by about 8-9 percent in 1954 as compared with 1951. Both production and consumption of all kinds of paper and board rose even more sharply, stimulating the demand for wood pulp for paper-making. In addition there was, on the whole, increased demand for textile pulp.

In the United Kingdom, production of newsprint set up a new post-war record, while output of other kinds of paper and board was the highest ever. To end-October, consumption of wood pulp for paper-making in the U. K. was 13 percent over the 1953 level: 1954 was, in fact, the first year in which wood pulp consumption exceeded the pre-war rate.

Similar developments in other Western Europe countries dependent on imported pulp (and notably in Western Germany) evoked a record production of wood pulp in the three northern countries — Sweden, Finland and Norway. Output in 1954 almost certainly exceeded 7 million tons, compared with 6.2 in 1953 and 6.6 in the previous peak year, 1951. Exports, on the basis of the latest available estimates, rose to slightly over 4 million tons, as compared with 3.76 million tons in 1951 and 1953. The rise in pulp exports was less pronounced, partly because of the impressive rise in production and exports of paper and board, partly because a substantial part of the 1953 exports was drawn from the high level of stocks accumulated at the end of 1952.

In spite of the heavy demand in Europe for Scandinavian pulp, prices remained unchanged for the greater part of the year. Some slight advances were recorded in the closing months — of the order of 5 percent — and some of the new fixings for 1955 delivery, though not all, show further slight advances. These changes are thought to represent a needed adjustment to various cost increases: they are not thought to presage a general marked upward trend. Indeed, the general impression is that producers have exercised laudable restraint, and that this is one of the factors giving the hope of new record levels of output and trade in 1955.

In North America, too, pulp production continued to rise. For the first half of the year, production was up by 6 percent in Canada and by 2 percent in the United States, as compared with the corresponding period of the previous year. The advance was less — in relative terms — than that registered in Europe. Moreover there was not an accompanying rise in consumption. In the United States, indeed, consumption may have fallen fractionally for the years as a whole. But the fact that consumption has been maintained — or nearly so — has in itself given considerable cause for satisfaction. In contrast to Europe, the general level of industrial activity had been running well below that of 1953, and fear had been expressed of a substantial falling off in the demand for paper products. The product versatility of the paper and board industry in the United States, and the fact that non-durable goods were less affected than durable goods by the industrial setback, perhaps explain why the pulp and paper industries fared better in 1954 than did industry in general. In Canada, however, production, consumption and exports all showed increases.

North American pulp prices again continued stable throughout the year.

In other parts of the world, production and consumption of pulp continue to advance steadily, with a slow but significant rise in capacity in the less developed regions.[1] In Japan, however, which for several years now has shown the most rapid advance in wood pulp production, the rising trend seems to have been checked; output in the first half of 1954 was almost exactly the same as in the latter half of 1953.

The differing trends in the development of pulp consumption and productive capacity on either side of the Atlantic have their counterpart in a significant shift in the trade pattern. Though European production is rising, demand is rising faster still, and there is an increasing disposition on the part of Western European countries to supplement their supplies of Scandinavian pulp by imports from North America.

[1] Note also recent pulp and paper development in New Zealand.

a course made possible by improved balance-of-payments positions. At the same time, United States producers, with capacity slightly over-expanded as new plants conceived during the 1950-1951 boom come into operation, have a new interest in finding export markets. Moreover, new United States production frees some Canadian exports for other destinations. Though American paper makers still require supplementary quantities of high quality Scandinavian pulps, in general the Scandinavian producers are finding it increasingly difficult to sell on the American market. Indeed, there are signs that the American market is, in fact, losing some of its former attraction as an outlet for Scandinavian pulp and paper.

The result has been a decline in the pulp and paper trade across the Atlantic westwards, and an increase eastwards. So much so that, in 1954, the net flow in the wood pulp trade was from North America to Europe, a fact which no doubt contributed to the price stability in the European market.

This shift is likely to continue in 1955: it is less easy to say whether it will become permanent. It could ultimately be reversed either by an upsurge in North American demand sharp enough to tax local capacity or by a recrudescence of balance-of-payments difficulties in Western European pulp-deficit countries. Neither of these eventualities is envisaged in 1955.

Is There a World Pulp and Paper Problem?

Since the end of 1952 the steady upward trend in world pulp and paper consumption has been resumed. There is every indication that this trend will continue. At the same time, the world's capacity to satisfy that demand is steadily rising. Two years ago there was a danger that the wave of investment which accompanied the 1951 boom would, as a result of the check to world consumption which occurred in 1952, lead to the creation of capacity beyond immediate future needs. But the revival in demand seems to have removed the danger of any substantial unused capacity in the immediate years.

It should be noted that the rise in production in recent years has not been the consequence solely of building new plants and installing new machines. The modernization of existing machines and the adoption of continuous working have also played an important part by enabling the more effective utilization of fixed capital. In both the world's principal producing centers — Europe and North America — the possibilities of raising output in these ways are far from being exhausted.

Can it therefore be said that a world pulp and paper problem still exists? Certainly the present situation, with a steadily expanding market and little vocal evidence of frustrated demand, has little in common with those which gave rise to the alarms of 1947 and 1950-51. The 1952 recession has almost obliterated from memory the corollaries of the boom which preceded it — schools starved for paper in many countries and an exceptionally high death rate among newspapers and periodicals unable to secure newsprint and printing paper in sufficient quantities or at reasonable prices. But though the emergency which prompted action by the United Nations and several of its specialized agencies has passed, a long-term problem remains: it is to the solution of this problem that the efforts of international agencies, and especially those of FAO, are being devoted.[2] The problem may be summarized as follows:

World production and consumption of pulp and paper are today highly concentrated. The four less developed regions — Africa, Latin America, the Near and Middle East, and the Far East — represent close on 70 percent of the world population. They consume little more than 8 percent of the world's paper and board; and they produce but 5½ percent of the world output of paper and 4 percent of the pulp. All the countries in these regions depend partly, and many of them entirely, on imported supplies.

Yet, relatively (though not absolutely) paper needs in these regions are rising more rapidly than in the more advanced regions. It is by no means certain that the traditional exporting centers, Europe and North America, will have a rising surplus over and above their domestic requirements to satisfy these needs. Moreover, the pattern of the world market is such that marginal changes in the supply/demand balance in the advanced regions could seriously interrupt the flow of pulp and paper to the less developed regions.

Even if import supplies were available in ample quantities, the less developed regions have too many calls on their limited foreign exchange resources to expand imports indefinitely. There is abundant evidence that already paper consumption in most of these countries lags far behind the levels appropriate to the stage of economic and cultural development they have reached.

The problem, therefore, is to encourage the expansion of indigenous pulp and paper production in these countries, so that they may have a greater security of supply and so that lack of these key materials does not hamper industrial, educational and cultural progress.

Most of these countries possess abundant resources of fibrous materials suitable for paper-making. Though important reserves of those coniferous species on which the European and North American pulp industries are largely based are few and far between in the less developed regions, there are many other species, coniferous and hardwood, in forests and plantations, from which paper can be made. There are also immense reserves of many non-wood fibers suitable for paper-making. The biggest single resource lies in the mixed hardwoods of the tropical forests — as yet scarcely tapped for pulp.

Moreover, technical advances in recent years have not only immensely widened the potential raw materials basis of the pulp and paper industry; they have brought about considerable reductions in the potential cost of processing non-conventional fibers.

But if it is true that there are ample reserves of fiber in most of these countries and means of processing them are available, what are the obstacles to rapid development? They can be stated very simply. Leaving aside generalities of overall resources and technical possibilities and considering only project assessment, there are five categories of problems: resources, techniques, markets, finance, cost.

[2] See also *World Pulp and Paper Resources and Prospects*, FAO, 1954.

Resources

It is not enough to know that a country possesses ample forests or resources of other fiber. It must be established that sufficient reserves exist in close proximity to a suitable site to allow their economic long-term exploitation on a sustained yield basis. At the present time, however, forest inventories with the detail necessary for such an appraisal rarely exist. Forest services are sometimes rudimentary and usually understaffed: there is a great shortage of trained personnel capable of carrying out this kind of work.

If the use of non-wood fibers is contemplated, it is necessary to establish that a sufficient and continuous supply can be made available to the pulp mill at a reasonable cost. This calls for careful and detailed enquiry into problems of collection, handling, transport and storage.

Techniques

Frequently, alternative processing techniques are available, and a choice has to be made in the light of the particular pulp and paper qualities it is desired to manufacture. Some processing operations, especially where non-conventional fibers are involved, have proved themselves in the laboratory but have yet to be fully tested on a pilot plant or industrial scale.

Markets

Many of the domestic markets, though expanding rapidly, are still small in relation to those served by industry in more developed countries. Detailed studies of present and potential markets are required to ensure that they can sustain mills of economic size.

Finance

To establish a new pulp and paper plant calls for heavy capital investment. But in the less developed countries the calls on capital are many; all these countries take measures to regulate the flow of capital. What are the special claims of pulp and paper? How can the flow of capital — public and private, domestic and foreign — be stimulated? What steps are necessary to reduce the danger of misinvestment? All these questions need to be examined.

Cost

Through every phase of project planning runs the problem of potential cost, of the ability of the eventual product to hold its own, in quality and price, in the market for which it is destined. For if newly established industries prove not to be viable but to require unnatural protection in the long term, then not only will further developments be frustrated but the country concerned will be committed to a permanently depressed level of paper consumption, and the fundamental objective will have been defeated.

It was to throw light on certain of these problems that, at the request of Latin American governments, three of the agencies concerned with the United Nations pulp and paper program convened a conference of experts in the pulp and paper industry. At the invitation of the Government of Argentina, this meeting was held in Buenos Aires from 19 October to 2 November 1954.

The Latin American Meeting of Experts

Nearly 200 experts, drawn from 14 Latin American and 10 other countries, participated in this meeting, and 72 papers were submitted for their consideration. Of these, 10 were prepared by the Secretariat, the remainder being written on invitation by specialists from 16 different countries. All the papers were specially prepared for the meeting and many contained important new material, hitherto unpublished. A number included the results of investigations specially undertaken in preparation for the meeting.

The session was formally opened by Carlos A. Hogan, Minister of Agriculture and Livestock of Argentina, who was elected chairman at the first plenary meeting, when addresses were also given by Raul Prebisch, Executive Secretary of the Economic Commission for Latin America (representing the Secretary-General of United Nations) and by Egon Glesinger, Deputy Director of the Forestry Division of FAO (representing the Director-General of FAO).

The work of the conference was directed by Carlos Quintana, for ECLA and the United Nations Technical Assistance Administration (TAA) and Arne Sundelin, for FAO. Tomas F. Desimone (Argentinian Ministry of Foreign Affairs) acted as Secretary-General, the co-ordinators being Pierre Terver, for FAO, and Alfonso Santa Cruz, for ECLA and TAA. Technical secretaries were Jack Westoby, of FAO and the Economic Commission for Europe (ECE), and Gerald Welsh, of FAO. J. Alfred Hall (Director of the Forest Products Laboratory, Forest Service of the United States Department of Agriculture) was appointed Rapporteur.

The range of expertise assembled was impressive. Some indication is given by the following list of specialists elected to preside over the discussions and drafting on the several points of the agenda:

Carlos Benko (Brazil)

Pulp and paper consumption, production and trade in Latin America;

W. O. Hisey (United States)

Economic aspects of pulp and paper manufacture from Latin American tropical and sub-tropical hardwoods;

Lucas A. Tortorelli (Argentina)

Aspects of pulp and paper manufacture based on other Latin American forest resources;

Joseph E. Atchison (United States)

Economics of pulp and paper manufacture from sugar cane bagasse;

Hans W. Giertz (Sweden)

Presentation of papers on selected technical matters;

Silvio Gagliardi (Argentina)

Review of the development prospects for pulp and paper industries in selected Latin American countries;

Stacy May (United States)
Financing Latin American pulp and paper development:

Percy R. Sandwell (Canada):
Newsprint:

Gardner H. Chidester (United States)
Committee and working group reports:

In addition, two special working groups were constituted with the following chairmen:

H. K. Collinge (Canada)
Technical assistance matters:

R. B. Jeffreys (Australia)
Eucalyptus.

The conference was not a gathering of government representatives, though a number of the experts attending held official posts in government departments or in quasi-governmental institutions, for example, in forest services, in economic ministries, in Development Banks; however, they attended in their private capacities. Thus the recommendations of the conference, though addressed in some cases to governments, involved no commitments by governments.

Space does not permit the reproduction here in full of all the experts' conclusions.[3] The following paragraphs summarize briefly the present situation in Latin America and draw attention to some of the interesting features of the meeting's deliberations and conclusions.

A conservative estimate sets Latin American pulp and paper requirements by the year 1965 at about double the region's average consumption during the years 1948-52. Given favorable economic developments, this estimate of future requirements (3 million tons of paper) might be considerably exceeded.[4]

These increased requirements are not likely to be met by imports from Europe or North America, nor can they be met by Latin American projects under construction or in the planning stage. The general situation is shown graphically in the diagram, which is based on the assumption that imports into Latin America of both pulp and paper will be maintained at their present level. The diagram shows two prospective levels of future capacity needs, one corresponding to favorable (not maximum possible) economic development, the other to only minimum economic growth. It also shows the estimated capacity by 1965 — on the most liberal interpretation, since many plans are included which are, at the present time, only under preliminary study.

Thus if clearly foreseen requirements are to be met, regional capacity for pulp and paper production must rise steeply over the next few years. There is definite need for the development of the product[i]
wood pulp, or of pulps capable of replacing mechanica
pulp for newsprint, and likewise of pulp for high str
wrapping papers.

The conference paid special attention to the economic aspects of manufacturing pulp and paper from tropical and sub-tropical hardwoods, the region's most important fiber resource. It examined carefully the experience already acquired in Latin America and in other regions, and reviewed the investment and production cost estimates set out in the Secretariat studies of hypothetical mills located in the Amapa region of the Amazon and the Yucatan peninsula of Mexico. The exploitation of tropical forests for pulp and paper raises new problems — of resource management, of pulp and paper technology, of economics. None of these problems are insoluble, but those relating to cost are likely to prove the most intractable. Since basic community services will generally be lacking, any new project will involve heavy "settlement costs." If, for social and economic reasons, governments consider developments of this kind to be desirable special action to reduce the burden of "settlement costs" is necessary for private capital to be attracted.

For a variety of reasons, locational factors weigh more heavily on investment and production costs in tropical forest projects than in the case of projects based on more conventional resources. Hence, correct site selection is crucial. Generally speaking, capital costs will be heavier for sites in undeveloped areas than for sites in industrial areas, but certain other costs, such as those for pulpwood and wages, will tend to be lower.

The experts reached the conclusion that available data demonstrated the possibility of converting pulp into satisfactory paper at competitive prices in national or regional markets, provided the site is correctly chosen.

Apart from the tropical and sub-tropical forests, Latin America possesses other important forest resources in the shape of considerable broadleaved and coniferous temperate forests, as well as extensive plantations of both categories, including both native and exotic species. The problems of regulating, exploiting, transforming (including transformation through exploitation) and extending these stands are not peculiar to Latin America, though local conditions change the weighing of the various factors to be taken into consideration when formulating policy. The conservation role of the forest was emphasized, and the need to consider each forest within the framework of a general resources and land use policy was stressed. The meeting touched on fire hazards and the dangers of overgrazing, and discussed natural and artificial regeneration.

Plantations, which offer a great attraction to pulp and paper manufacturers because they can afford a high yield of suitable, homogeneous material and because development may be possible in close proximity to industrial areas, are particularly to be recommended in those instances where they either constitute the best form of land utilization or represent a profitable use of presently unprofitable forest sites. There is great need in Latin America, however, for the exchange — both within the region and with other regions — and analysis of experience acquired on both the silvi-

[3] A full account appears in a preliminary *Report of the Latin American meeting of experts on the pulp and paper industry. (Part II. Resumé of the meeting: its aims, deliberations and conclusions*, pp. 17-30). The Final Report, to be published later this year, will include, either *in extenso* or in summary version, the papers submitted to the meeting.

[4] These Secretariat estimates were confirmed by investigations, official and unofficial, undertaken in several Latin American countries and also, so far as newsprint, printing and writing paper are concerned, by the independent study commissioned by UNESCO from the Intelligence Unit of *The Economist*, London.

cultural and economic aspects of plantations, and for more and better co-ordinated research.

These other Latin American forest resources pose fewer technical problems for pulp manufacture. There was special interest in assessing the possibilities of the region's extensive eucalyptus plantations, and a working party set up to consider this matter reported encouraging prospects, though mechanical pulps produced therefrom are likely to be of poor quality and usable only as low percentages in blends for the manufacture of newsprint.

The most important non-wood fiber resource is bagasse, of which Latin America produces annually about 26 million tons fresh bagasse containing 50 percent moisture. This could provide 4 million tons of pulp, but today only 1-1½ percent of this quantity is being pulped in the nine existing mills using this new material. Here the problem is to free bagasse — presently used as fuel in the sugar cane milling operations — for paper making, either by improved thermal efficiency in the sugar mills or by conversion to the use of an alternative fuel. Since the capital costs of conversion are low, the dominant element in the cost of releasing bagasse for pulp by the latter method is the cost of a substitute fuel. This limits the future contribution of bagasse to the Latin American pulp and paper industry. On a long-term basis, however, there is no doubt that bagasse, because of a variety of favorable economic factors, will play an important part in future developments, with an obvious significance in those countries where supplies of other fibrous raw materials are lacking and especially where cheap fuel oil is available.

A discussion on development prospects showed that most Latin American countries, recognizing the social and economic value of a creative industry based on a renewable resource and with the capacity for generating new and allied industries, were giving a prominent place in their plans for industrialization to the development of adequate productive capacity for pulp and paper. Raw material supply differences and specific economic circumstances may be expected to give rise to a tendency towards specialization within countries; the complementary nature of resources in neighboring countries suggests that it would be desirable to facilitate the development of intra-regional markets in pulp and paper.

Economic considerations are primarily responsible for the fact that, as yet, plans for expanding newsprint production fall short of expected future needs. At the present time, Latin American newsprint production is mainly based on traditional fibers, which are lacking in many countries within the region. Today, it is technically possible to produce a satisfactory newsprint of unconventional composition, reducing the furnish of coniferous long-fibered pulp. Newsprint mills however are generally specialized and require large investments and a relatively large output. Thus, governments which wish to ensure domestic supplies of newsprint must take cognizance of the economic disadvantages under which such a new industry may, in certain cases, have to operate.

To achieve a reasonable level of paper production by 1965 the amount of new investment required annually is between US $50 and 90 million. These figures need not be regarded as unattainable; even the higher figure corresponds to only 1½ percent of average annual investment in Latin America in the post-war period. About half the amount would be required in the form of foreign exchange, but that represents only 0.5 percent of the region's foreign exchange earnings.

However, capital — whether public or private, local or foreign — will only become available for projects which succeed in satisfying strict criteria. The experts set out in some detail the various points on which investors need to be satisfied. They laid emphasis on the need for competent and thorough-going preliminary investigation of all aspects — technical and economic — of proposed projects. Such investigations will take time, and will involve considerable expense. Nevertheless, they are indispensable, and those intending to operate the project must be prepared to bear the cost. If the results of these investigations are presented in the form required by financing agencies, and if the conclusions are satisfactory, then it should be possible to procure the necessary capital. [5]

If the development of new pulp and paper production along sound technical and economic lines is to be ensured, Latin America's greatest problem is the lack of technically trained personnel for managerial and supervisory positions; in addition, a volume of advice and direct technical assistance is needed that cannot yet be adequately obtained from existing agencies and local sources. The experts believed that regional co-operation and programming of research and training activities was necessary and practicable. They drew attention to the need for parallel developments in the field of pulp and paper technology. Finally they recommended that an advisory group, consisting of experts on all aspects of the pulp and paper industry, be placed at the disposal of Latin American countries; such a service, they believed, could be provided through the United Nations Expanded Technical Assistance Program.

The Buenos Aires meeting has given stimulus to the development of the Latin American pulp and paper industry.

For this much credit must go to the Argentinian government, which acted as host. The intensity of Argentina's own interest in the problems before the conference was made clear in the course of a lively and stimulating discussion between many of the experts and President Peron, who received them at the presidential palace. Throughout the conference, representatives of various Argentinian government departments, the forest service, the pulp and paper industry and the trade unions all collaborated to ensure that the experts' time was usefully and pleasurably employed.

[5] The paper "Financing pulp and paper development in Latin America" which was prepared by the Secretariat, in co-operation with the Economic Commission for Europe, is reproduced earlier in this issue. The concluding paragraphs of the conference's report on this item of the agenda are appended.

The Work of FAO

The Conference of FAO, the governing body of the Organization, has made a considered effort to build up permanent machinery to bring together leading administrators and specialists concerned with forestry and forest products for periodic high-level discussions of regional or special problems. This has now reached a point where the machinery covers, by regions and by subjects, much of the entire field of FAO's responsibility. The aim will continue to be international agreement and the exchange of technical information on which international action can be based.

The principal regional bodies already established, and which will meet in 1956 or 1957, are the:

Asia-Pacific Forestry Commission (APFC),

European Forestry Commission (EFC)

Near East Forestry Commission (NEFC),

Latin American Forestry Commission (LAFC),

Joint Sub-Commission on Mediterranean Forestry Problems (SCM).

The terms of reference of the regional forestry commissions are broadly to co-ordinate national forest policies on the regional plane to the extent that this is considered desirable; to exchange information and advise on recommended practices in regard to technical problems; and to make appropriate recommendations to the Director-General and to governments. Between sessions the FAO Headquarters staff is responsible for the implementation of decisions, if necessary with the assistance of consultants, technical assistance experts, working parties or special technical meetings.

The activities of these bodies require close collaboration with the United Nations and its three regional Economic Commissions — the Economic Commissions for Asia and the Far East (ECAFE), for Latin America (ECLA), and for Europe (ECE). The professional staff for the Timber Division of ECE and the secretariat for the ECE Timber Committee are provided jointly by ECE and FAO. Such co-operation serves to avoid duplication of effort and helps to secure realization of recommendations, especially where these go beyond the immediate competence of forest authorities.

Permanent bodies on special problems include the International Poplar Commission and the International Chestnut Commission, while a sub-commission on teak is about to be started in Asia. In addition, the Director-General has been requested to convene certain special technical meetings or conferences in 1956 or 1957, including a Latin American poplar conference, a eucalyptus conference, and the Fourth Conference on wood technology.

Also in 1956 will be held the Twelfth Congress of the International Union of Forest Research Organizations (IUFRO), a non-governmental body with which FAO has a formal agreement for co-operative work. Preliminary planning for the Fifth World Forestry Congress will also be started.

ECE Timber Committee

The Timber Committee of the United Nations Economic Commission for Europe held its twelfth session at Geneva from 4 to 9 November 1954 under the chairmanship of F. M. du Vignaux (France). J. O. Söderhjelm (Finland) and J. Kaczerginski (Poland) were elected as vice-chairmen, and representatives of 20 European countries and of the Soviet Union, Canada and the United States participated in the session. Representatives from Bulgaria, the Eastern Zone of Germany and Hungary were present for the first time.

The Committee carried out its customary review of the European timber market for the current year and the coming year on the basis of facts and figures supplied during the session.

Firmness, with a balance between supply and demand, characterized the European market in sawn softwood in 1954. The level of imports proved higher than was generally expected, mainly due to the abolition of consumption controls in the United Kingdom, but the high level of general economic activity in Europe — especially in house building — also played a part. Nevertheless, consumption did not rise commensurately with output of the sawmill industry and sawn timber prices were still high in relation to those of competitive materials so that substitution appeared to continue.

Reviewing prospects for the coming year, the Committee envisaged little change in the level of total demand, while prospective export availabilities seemed to be adequate. No significant fluctuations either in prices or in the volume of trade were expected in 1955. It was noted that log prices seemed excessive in relation to present sawnwood prices, and any further rise in the latter would seem to jeopardize consumer demand, especially in importing countries.

Consumption of pitprops in Europe was believed to have declined. The volume of imports during 1954 was low but stocks in the importing countries were well maintained. The present stability in the pitprop market was likely to continue.

Demand for pulp and paper, and hence for pulpwood, rose steadily during 1954. However, both production and export availabilities exceeded expectation, and no major difficulties were experienced. Progress continued in the pulping of hardwoods and of inferior softwoods so far not generally used — an encouraging trend in the direction of the more rational utilization of timber. Strong demand for pulpwood was expected in 1955, but supply prospects indicated that the requirements of European pulp mills would be met.

Some members of the Committee thought that long-term trade arrangements might be a useful way of achieving stability in the European timber market, but others maintained that such arrangements would be confronted with considerable opposition and difficulties in many importing and exporting countries at the present time. As another means, the Committee therefore envisaged reviewing the forward situation for a lengthier period than one year at its next session.

Satisfaction was expressed with the results so far achieved in the field of logging techniques and training of forest workers. The proposal to establish a Joint Committee between FAO and ECE to continue the work initiated by the European Forestry Commission (EFC), was approved.

The Committee also discussed and made recommendations on a number of other items figuring on its agenda, notably timber price statistics, substitution of timber by other materials, standardization of softwood grades and sizes, and the elaboration of more uniform conditions of sale and appropriate contract forms in respect to various categories of timber. The bigger producing and importing countries had established standard contracts but the smaller producers and importers had not, which put them at a disadvantage.

Eucalypt Study Tour

One of the bodies mentioned above, the Joint Sub-Commission on Mediterranean Forestry Problems, was initially established by the European Forestry Commission (EFC), but in 1953 was altered by the FAO Conference into a joint body with the Near East Forestry Commission, to be concerned with problems of countries of the Mediterranean basin and eventually of areas of similar climatic conditions elsewhere in the world. The fourth session of this body, *Silva Mediterranea*, was reported in the last issue of *Unasylva*.

The third session (Turkey, 1952) recommended that Member Governments set up national working teams of experts on eucalypts which should meet periodically to exchange information on such problems as choice of species, planting and management. The first of such meetings was arranged in Morocco from 22 to 31 October 1954, at the invitation of the Resident-General of the *gouvernement chérifien*. Experts from Algeria, Cyprus, Italy, Libya, Metropolitan France, Morocco, Portugal and Tunisia, participated in an instructive study tour organized by the Administration des Eaux et Forêts, and A. Métro, Director of the Forest Research Station at Rabat. (Mr. Métro's study for FAO, *Eucalypts for Planting*, has recently been published.)

In the course of this tour, the participants were able to inspect work with eucalypts under a variety of conditions throughout the country. Nurseries, arboreta, shelterbelts, watershed plantings, soil conservation demonstrations, sand dune control installations, and profitable commercial plantations were seen. The high caliber of the technical work accomplished by the Moroccan foresters was impressive. Especially to be noted were the close and effective relations existing between the administrative forestry officers, the research personnel, local government administrators and private owners of eucalypt forests.

The participants discussed the particular technical points which they had agreed to study and undertook to work on these problems within their own countries and report back at the next session of the Mediterranean Sub-commission. These points included adoption of a standard identification form, the carrying out and recording of technology tests, the propagation of eucalypt hybrids by cuttings, seed collection and exchange, and the effect of eucalypt cultivation on soil development, since in a number of countries it has been found that the rate of growth in artificial plantations markedly decreases after three or four rotations.

European Forestry Commission

The European Forestry Commission of FAO held its seventh session at the Palais des Nations, Geneva, from 8 to 13 November 1954, under the chairmanship of E. Saari (Finland), with S. Duschek (Austria) as vice-chairman.

The following member countries were represented: Austria, Belgium, Denmark, Finland, France, Federal Republic of Germany, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom and Yugoslavia. Observers from Bulgaria, Czechoslovakia, Hungary, Poland, Romania, Eastern Germany and the U.S.S.R. participated for the first time. Several international organizations were also represented.

In his opening speech, Mr. Saari welcomed the observers from the Soviet Union and the eastern European countries and hoped they would continue to help with the Commission's work. Mr. Leloup, Director of the Forestry Division, FAO, referred to the Commission's role as a pilot model for the forestry commissions set up in other regions, while the Executive Secretary of the Economic Commission for Europe, Mr. Myrdal, spoke of the experience in collaboration between FAO and ECE. He emphasized the part that forestry could play in the economic development of the countries of southern Europe, in which ECE was vitally interested.

In its usual review of national progress reports on forest policy, the Commission took note with appreciation of the many important measures that had been taken by Member Governments, such as the adoption of new forest laws, adjustment of forest management to current economic trends, integration and rationalization in the wood-using industries, intensification of research and wide dissemination of the results, and measures for guaranteeing workers stability of employment and for improving their living and working conditions.

Examining figures of felling forecasts for 1954 and 1955 and of actual cut in 1953, the Commission concluded that the cut for the region as a whole would probably prove higher in 1954 than in 1953 and might reach the 1952 level. The percentage of industrial timber was increasing slightly. The Secretariat under R.G. Fontaine (FAO) was requested to produce for a future session a comparison between national "allowable cut" and felling forecasts.

The permanent working party on afforestation and reforestation met for two days prior to the full Commission, with W. Plym Forshell (Sweden) in the chair. On the basis of its report, the rate of development in 1953 of afforestation, planting outside the forest, forest improvement and reforestation operations under long-term programs was regarded as satisfactory. For example, 241,500 hectares were afforested in 1953, as against 223,500 hectares in 1952. The Commission recommended that current policies be continued and suggested that if approved programs began to appear inadequate to meet trends in timber demand, any necessary acceleration and enlargement of activities should be brought about by granting more funds and equipment to the agencies now already in existence, rather than by creating any new agencies.

The Commission heard with interest statements on forest policy from the observers of the U.S.S.R. and eastern European countries, and also the news that *Endothia parasitica* was attacking oak and elm in the Soviet Union, as well as chestnut, and that two experimental stations were actively engaged in investigating methods for controlling the spread of the disease.

Delegates recognized that television was becoming an increasingly efficient instrument for general publicity purposes, and Member Governments were advised to consider the production of forestry films especially suited for showing on television programs.

To simplify the despatch and exchange of films, the Commission recommended that those governments which had not yet done so should become parties to the UNESCO-sponsored Agreement on Importation of Educational, Scientific and Cultural Materials.

Like the ECE Timber Committee, the Forestry Commission concurred with the establishment of a Joint Committee on forest working techniques and the training of forest workers. This Committee is to foster international collaboration in improving working techniques and training in logging and other forest operations.

with a view to increasing productivity and a higher standard of living for forest workers. Special attention is to be given to increasing the efficiency of labor while reducing the manual effort required, and to the prevention of accidents and the reduction of waste. A description of the work underway was contained in the last issue of *Unasylva*, together with a report on another concern of the European Forestry Commission, protection from avalanches and torrent control.

The Commission drafted outlines of a future investigation into the status of 'small woodlands', a subject of study adopted at the preceding session. It felt that the preservation and increased productivity of farm woodlands and small forest properties, and the establishment of commercial plantations, entailed:

(*a*) extension services to owners;

(*b*) financial assistance in the initial operations of establishment, in carrying out improvement works and in purchasing equipment;

(*c*) tax relief where the owner can prove financial sacrifice; and specific legislative measures, particularly towards such ends as consolidation of holdings, [illegible] of owners' ass[illegible] co-operatives.

The Secretariat under R. G. Fontaine (FAO) would prepare a questionnaire for circulation before the next session. Member Governments, in replying, would be asked to distinguish between woodlands that were and were not worked under the supervision of a trained forester.

At the conclusion of the session, Sir Henry Beresford-Peirse (United Kingdom) and J. Keller (Switzerland) were unanimously elected chairman and vice-chairman respectively for the ensuing period.

Technical Assistance Notes

Through 1955, it is expected that there will be some 50 technical assistance officers operating on forestry missions in 22 countries of the Far East, Near East, Latin America and southern Europe. These experts will themselves be drawn from 15 different countries. In addition, specialists will be filling short-term assignments in connection with training courses, seminars and regional development projects such as the Central American Integration Scheme.

A report on the achievements and also the disappointments of the Expanded Technical Assistance Program (ETAP) to date will be issued later in the year as one of the features marking the Tenth Anniversary of the formal founding of FAO.

Fellowship Program

Recently the arrival was celebrated at Rome Headquarters of the 500th holder of a Fellowship awarded by FAO under ETAP. He came from Indonesia where he is the manager of a sawmill, and he was proceeding initially to Belgium to study the maintenance of saws — "sawdoctoring" as it is called.

The history of this Fellowship program dates back to 1949 when the General Assembly of the United Nations approved the creation of a special technical assistance fund through which experts might be sent to requesting countries to help with problems of economic development, demonstration equipment might be supplied to assist the experts in their tasks, and Training Centers and Fellowships might be established to train nationals of the country in which the experts were operating and so help assure continuity to the programs and projects which were recommended.

The operation of the Fellowship Program is in the hands of a special section of the Director-General's office at FAO Headquarters, and this section is responsible for the selection of students and arrangements for their courses of study.

Allocation of Fellowships

The funds available for the Expanded Technical Assistance Program rarely permit the grant of as many Fellowships as member countries request, and in principle they can only be awarded in the proportion of two Fellowships for every expert serving in the field. Preference is given to individuals of proved ability and a fair amount of experience in their particular field of activity. Furthermore, priority is given to those technicians who have already worked in collaboration with a particular technical assistance officer and who are judged best qualified to carry on his work. The actual nomination of candidates is made by the authorities in the country concerned on the advice of ETAP experts, but the final selection rests with the Chief of the Technical Assistance Program at FAO Headquarters in consultation with the technical Division directly concerned and with the Chief of the Fellowships Section.

The ETAP expert working in a country has a personal knowledge of a candidate's ability and of the problems which he will be called upon to face. He is, therefore, in the best position to suggest the most profitable line of study to be pursued, and in what countries the Fellowship holder should work in the light of his language qualifications. The length of a course may vary from several months to one year, but only in exceptional cases can it be protracted over two or more years.

The successful candidate is first briefed either at FAO Headquarters or at a Regional Office. If possible, he discusses his work with the FAO officer specializing in the same field of activity, who will subsequently follow the man's studies and give advice. Throughout his period of training, the Fellow is required to present monthly reports to FAO which are studied and commented on by the Division concerned. On completion of his course, he is asked to write a comprehensive report showing how the training acquired has application to the special problems of his own country.

Training in forestry and forest industries

A dearth of forest administrators, foresters and technicians is a marked feature of many "recipient countries" under the Technical Assistance Program. The opportunities offered by the Fellowship Program therefore answer a keenly felt need, especially where a whole development program may be in jeopardy because of the lack of certain key qualified nationals to implement the detailed recommendations of the foreign advisors. For this reason, the Forestry Division has always favored the grant of the maximum number of Fellowship vacancies available to it. In the period from 1951 through 1954, some 80 Fellowships have been awarded covering all spheres of activity connected with forestry and forest industries.

The Fellowship Program has not, of course, been all plain sailing. There have been difficulties and setbacks. Some courses of study have not been judiciously chosen, being too advanced or involving too much travel, or a Fellow, through language troubles or failure to adjust to strange surroundings, has not been able to profit as he should.

In spite of this, the Fellowship Program has on the whole already yielded valuable results. FAO receives reports on what the Fellows do after returning to their own countries and these show that in large measure they are usefully contri-

GUATEMALA. *A stand of* Pinus montezuma, *partially cleared for cultivation.*

buting to economic and technical development in their own spheres of interest.

In such a long-term activity as forestry, it is of course difficult to assess results after only three years. There is, however, good evidence of the value which governments attribute to the Fellowship Program, and requests for Fellowships show no sign of abating, although the emphasis given to the various fields of specialized training is changing as the Expanded Technical Assistance Program itself tends gradually to change in emphasis.

Guatemala

The FAO regional forestry officer took the photograph on this page of a stand of *Pinus montezuma* partially cleared for cultivation. Shifting cultivation practices of this sort are responsible for the progressive destruction of the forests of the highlands of Guatemala, and for the enormous quantities of silt carried by the rivers of the country. Although laws exist that forbid shifting cultivation, it is impossible to enforce them until alternative, suitable agricultural land can be made available to the cultivators or they learn methods of increasing the yields from the land already under cultivation so as to obtain a permanent livelihood. An ETAP report to the Government of Guatemala makes recommendations as to how forest conservation and regulation of stream flow can best be promoted.

Nepal

An FAO report to the Government of Nepal on forest development recalls the past history of forest administration in that kingdom and summarizes the forest situation in the uplands. A broad stretch of country between 4,000 feet (1,200 m.) and 9,000 to 10,000 feet (2,700-3,000 m.) in altitude, called the Mahabharat, runs the whole length of Nepal. The forests consist generally of a great mixture of species, chiefly oak, rhododendron, *Castanopsis*, poplar, walnut, *Myrica*, alder, *Michelia*, magnolia and, in parts, conifers.

In the east, the main species are *Schemia*, *Michelia*, oak, magnolia, larch and *chir* pine (*Pinus longifolia*). None of these has yet been exploited commercially. A fairly dense population practising shifting cultivation has cleared all but the inaccessible and remote parts of the forest: practically nothing remains but occasional stands and some small inferior clusters on steep slopes and rocky terrain. These forests are still of importance for supplying poles, wood for farm implements, fuelwood and forage, and for helping in soil conservation.

In the west, the main species are *khail* (*Pinus excelsa*), *chir* pine, walnut and cedar. Since the population is less dense here, some fairly extensive forests still maintain their existence. In the upper basins of the Mahakali and Karnali rivers, there are almost virgin stands of *khail* and deodar mixed with walnut. Deodar is found as far east as the Gandak river (Narayani). The forests have so far been but little used except in the lower basins of the Mahakali and Karnali where the *chir* and deodar have been logged on a small scale in the last five years.

Parts of the vast alpine area bear some of the finest and most valuable forests in Nepal. One part the ETAP officer visited had the following succession of species: at 9,000 feet (2,700 m.), the *khail* at its best, with some pure 80-year old stands carrying 500 to 700 cubic meters to the hectare. Up to 10,000 feet (3,000 m.), magnificent forests of this species mixed with *Picea morinda*

NEPAL. Alnus nepalensis *likes humid sites. This in an 18-year-old plantation on old terraces no longer cultivated.*

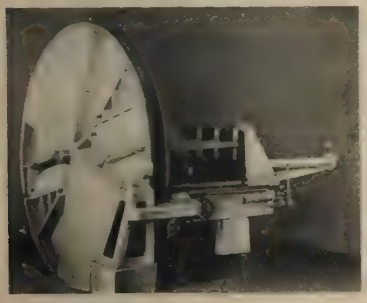
and *Abies pindrow*. Above that *khail* gradually gives way to *Cupressus torulosa* and *Juniperus*. Of the hardwoods, oak and maple occur up to 9,500 feet (2,900 m.), and from there to the timber line, birch. Above the timber line, at 13,000 to 14,000 feet (4,000-4,300 m.) in this part of the Himalayas (upper valley of the Marsyandi Khoma), the ground is so steep that there is practically no alpine pasture.

Equipment News

Interest in the development of forest utilization and woodworking industries is reflected in the continual demand for information on new equipment. FAO's Forestry Division collects such information and passes it, on request, to Member Governments: a selection is published here. FAO accepts no responsibility for the claims of manufacturers.

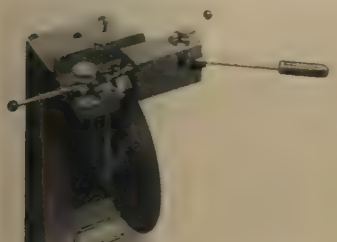
ONE-MAN CHAIN SAW (*Model 4-30*). *4 hp gasoline engine; weight 30 lb. (14 kg.). Available with 14, 18, 24, 30, 36 and 42 inch (36, 36, 61, 76, 91 and 107 cm.) straight blades and 15 inch (38 cm.) bow. Also Two-man chain Saw (Model 99).*

McCulloch Motors Corporation, Los Angeles 45, Calif., U.S.A.



WOOD-SLICING MACHINE *for cutting thin softwood boards for box manufacture. Cuts by rotating knives set in a cast-iron cutter disc of large diameter.*

Industrie-Companie, Postfach 468, (22a) Krefeld, Germany.



HIGH PRECISION CIRCULAR SAW SETTING APPARATUS, (*Model P.H.1.*), *for blades from 5 1/4 to 20 inches (13 to 50 cm.) diameter and up to approximately 1/5 inch (5 mm.), 6 gauge, in thickness. Manually operated. Precision of teeth setting: plus-minus 0.0004 inches (0.01 mm.).*

Interwood Ltd., 326 Old Street, London, E.C.1., England.

Not Illustrated

"KPM" MOISTURE METER (Type HMI), battery-operated pocket size surface-reading instrument for all kinds of wood including veneers. An electrode attachment with drive-in hammer is available for deep measurements.

K. P. Mundinger G.m.b.H., Renningen, Württ., Germany.

HAND SHARPENER for rip or cut-off saws up to 60 inch (150 cm.) diameter.

Armstrong Machine Co., 120 N.W. Ninth Avenue, Portland 9, Oregon, U.S.A.

MOBILE SAW for the conversion of thinnings into pitprops. All operations hydraulically controlled. Air-cooled diesel engine.

Cundeys Ltd., Alfreton, Derbyshire, England.

"LA FORESTIÈRE ERVE", to cut poles, fuelwood, pulpwood, pitprops etc. into desired lengths: diameter of saw blade 60 cm.

Constructions Mécaniques R. Valentin, 50 rue Gabriel, Mouilleron, Nancy, France.

WOOD HOG (Model 145) for converting waste wood, bark, pulp bolt rejects, slabs, edgings, peeler cores, trim ends, etc., into fuel chips.

Diamond Iron Works (Division Goodman Mfg. Co.), 4834 S. Halsted St., Chicago, Ill., U.S.A.

MOBILE WOOD CHOPPER "NORTHGATE" for converting tree tops, small branches, brushwood, etc., into fuelwood of 6 inch (15 cm.) lengths. Self-contained power unit. Automatic device for loading into wagons.

Curven and Newbery Ltd., Engineers, Northgate St., Devizes, Wiltshire, England.

"TREEHOG", wheel mounted 30 inch (65 cm.) diameter circular saw for land clearing work, felling and bucking; 5 hp. gasoline engine. One-man operation.

Lane and Whittaker Ltd., Ketley, Wellington, Shropshire, England.

"SPIEGELRELASCOP", *a small instrument used for measuring the diameters of single standing trees at any desired height, of the basal area per acre in square feet, and of tree heights or any differences of heights. Can also be used as a level with readings in percentages and degrees.*

Dr. Ing. Walter Bitterlich, Hallein 257, Salzburg, Austria.

MECHANICAL DEVICE FOR DEBARKING LOGS *by hand operation.*

Etablissements André Vigneau, Norrois par Frignicourt (Marne), France.

PORTABLE DEBARKING MACHINE "JÄTKÄ 1", *disc type, for pulpwood not exceeding 3 1/2 feet (1 m.) in length. Weight with engine, 478 lb. (215 kg.); 4 hp gasoline engine. Capacity, 70 cubic feet (2 m³) rough wood per hour. Model 2, weighing 626 lb. (285 kg.), handles pulpwood lengths from 4 to 7 1/2 feet (1.2 to 2.3 m.). Capacity, 200 cubic feet (5 1/2 m.) half-barked wood per hour.*

Aug. Eklof AB, Borga, Finland.

DEBARKING MACHINE *with 10 hp diesel engine. The bark is removed by application of pressure between three rollers, the log being propelled forward and rotating at the same time. Stationary model or mounted on two wheels.*

J. R. Gordon and Co., 14 Newgate St., Chester, England.

TIMBER ARCH "WHITMORE" *for the extraction of thinnings, poles, etc. With hand operated winch attached to the arch frame. Adjustable width from 4 feet to 5 feet 2 inches. (1.2 to 1.6 m.). Weight, 616 lb. (190 kg.).*

Reginald Tildesley Ltd., Willenhall, Staffs, England.

LOG DEBARKING MACHINE "SKOGLUND" (*Model M 12*), *mounted on tyres. For poles of 2 to 12 inch (5 to 30 cm.) diameter, with minimum length of 6 1/2 feet (2 m.). Capacity, 275 10 1/2 foot (3.2 m.) logs per hour. Available accessories: log conveyor, chip conveyor, diesel-driven generating unit.*

AB Gävle Varv, Gävle, Sweden.

Not Illustrated

ALL-STEEL DISC TYPE DEBARKER with air-cooled engine (gasoline, diesel or paraffin) mounted on tyres. May also be equipped as a 3-unit machine with 3 discs in line.

Cundeys Ltd., Alfreton, Derbyshire, England.

DEBARKING-SQUARING DEVICE (Model J. F.) to debark and to cut off knots and branches.

Etablissements A. Felten, 15 Boulevard du Président Wilson, Strasbourg, France.

MIRA DEBARKER. A single log machine, with rotating barking drum and devices for the feeding-in and feeding-out of logs. Can be mounted on rubber-tyred wheels.

AB C. J. Wennbergs Mekaniska Verkstad, Karlstad, Sweden.

CRAWLER TRACK SHOES for Caterpillar D2 tractor. Width of shoes, 30 inches (75 cm.).

Caterpillar Tractor Co., Peoria, Ill., U.S.A.

TRUCK ATTACHMENT FOR ROUGH TERRAIN "JUNGLETRACK", for use with a standard truck in jungle swamp, spring thaw conditions, sand or snow.

The Track Corporation, Orillia, Ont., Canada.

TILTING FORK *attachment for "Tracto-Lift" fork trucks, for handling of logs. Hydraulically operated. Can be tilted downward 45 degrees or upward 25 degrees.*
Tracto-Lift Co., 800 East 18th St., Kansas City 8., Mo., U.S.A.

"MUDMASTER" *detachable crawler tracks for every type of vehicle. For use in deep mud, snow, etc.*
Bates Bros. Ltd., Baguley, Wythenshawe, Manchester, England.

Not Illustrated

TRENCHING PLOUGH "Waplan", for draining of woodlands, making road ditches and fire lines. Operates behind a crawler tractor of minimum 5 tons' weight and equipped with a winch. Independent hydraulic control of trenching operations by a 5 hp. gasoline engine. Maximum digging depth, 1 m. Approximate weight, 2,300 kg.

Waplans Mekaniska Verkstads A/B, Waplan, Sweden.

TRACTOR LOG TONGS ATTACHMENT for Allis Chalmers tractors "H.D. 15 G" or "H.D. 20 G". Hydraulically-operated equipment intended for lifting and carrying loads from 12,000 to 16,000 lb. (5,400 - 7,300 kg.).

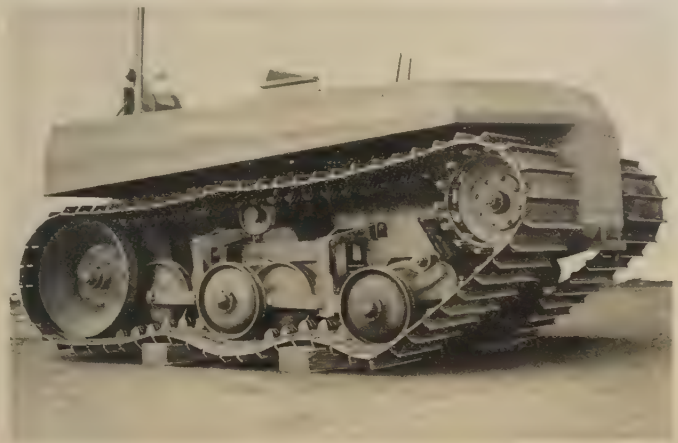
Allis Chalmers Mfg. Co., Milwaukee 1, Wis., U.S.A.

SINKER GRAPPLE for hooking sinker logs out of either deep or shallow water.

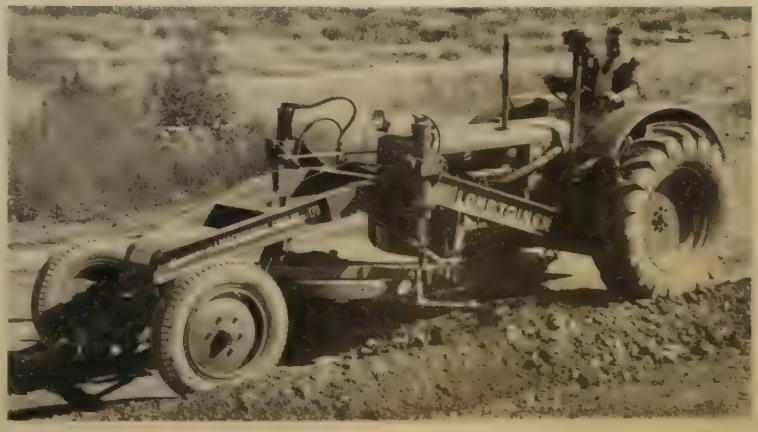
Skookum Co., Portland, Ore. U.S.A.

"THE LANDTAINER", *attachment for the conversion of wheel tractors of 35 to 55 hp. into motor-graders. Consists of a steel frame which carries two hydraulic lifting jacks and the blade assembly. The blade can rotate 90 degrees horizontally, and dig from 14 1/2 to 18 1/2 inches (37 to 47 cm.) deep according to tractor size.*

Landsborough Findlay (S.A.) Ltd., P.O. Box 5863, Johannesburg, South Africa.



"WATER BUFFALO", *a 67 hp. diesel crawler tractor, specially designed for operations on soft land and swamps.*
Albion Motors Ltd., Scotstoun, Glasgow, W. 4., Scotland.



News of the World

The items appearing here are condensed from newsworthy material collected by FAO staff or submitted by correspondents. FAO assumes no responsibility for statements and statistics in items accepted in good faith from contributors.

Argentina

• Among the objectives of the Second Five-Year Plan is the creation of a "national forestry conscience" through education in the primary schools, high schools and colleges all over the country. It has been decreed that all the educational institutions coming under the Minister of Education and situated in both rural, urban and suburban zones shall, providing space permits, set aside a section of their area for the establishment of tree nurseries, to grow the species most appropriate to the region. The trees so obtained are to be planted in the school grounds or, in agreement with the competent authorities, along neighboring streets and highways. Trees can also be distributed on request to persons who undertake to plant them on their own lands.

School directors are required to work out with local government officers schemes whereby pupils and teachers can co-operate in the tending of public parks and gardens. They have to appont a member of their staff to keep in contact with the *Administración Nacional de Bosques* to assure co-ordinated action.

Australia

• In the past, the use of sawnwood for boxes represented a considerable portion of total sawnwood consumption in Australia and provided a market for timber which often could not be otherwise utilized. Because this use was known qualitatively to have declined seriously in recent years, it was decided to determine the actual position and to make a first investigation of the causes of the decline in the State of Victoria. The results are published in a report entitled *Wooden Case Industry of Victoria* issued by the Director-General, Forestry and Timber Bureau, Commonwealth of Australia. The substitution of sawnwood by boards appears quite strikingly. In 1952/53 the utilization of timber for cases was only 56 percent that of 1947/48. The decrease in the use of hardwoods was markedly great, the quantities utilized now being only 36 percent that of 1947-48. Whereas in 1947-48 some 18.7 million wooden cases were used, in 1952-53 it was only 10 millions. The price rise of sawnwood favored the use of corrugated paper and of boards whereas prices for board rose in the past six years by 63 percent, and those of boxboards rose by 95 percent. There remains, however, a number of commodities for which wooden cases are still preferred.

The investigation has shown that price, weight, appearance, ease of labelling, handlling, storage, assembly and filling, favors boards as raw materials, although strength and moisture resistance make wood superior. Some markets for wood have been permanently lost and there is a possibility that further markets may also be lost unless efforts are made to improve the quality and cheapen the cost of wooden cases and better satisfy users' requirements. Any research which is likely to halt the decline in the use of wooden cases and perhaps reverse the trend, is not only in the interest of the industry but also of forestry, as a large number of small mills, situated in regions where other forms of utilization are not practicable under present conditions, depend on the fabrication of wooden boxes.

Austria

• Human labor in forestry was for a long time neglected as a subject of scientific research, but during recent years work science has caught up and developed into a very considerable branch of the forest research tree.

The German-Austrian Society of Forest Work Science (GEFFA) celebrated its 25th anniversary in 1952, and assembled a large number of scientists from Central Europe. In a series of excellent papers, experts reported on the progress reached in this field of research, on equipment and efficiency of working techniques, training of forest workers and foremen, establishment of wage-scales, and human relations at all levels of man management. All these subjects are important in any forest operation, and because of the interest aroused by these reports, they have been printed and made available in the form of a handy publication entitled *Forstliche Arbeitslehre und Menschenführung*, published by Fromme and Co., Vienna and Munich.

Belgium

• The Seventh Congress of the International Federation of Building and Woodworkers, held in Brussels in September 1954, gave much attention to the conditions of employment in forest and woodworking industries. The executive body decided that it would, in conjunction with the International Landworkers' Organization, try to arrange a world conference to discuss the problems of forestry workers. Forestry was at a disadvantage as compared with many other industries. The conditions of employment were so diverse in the various countries that it was impossible to take up a unified position in relation to working conditions. Accidents occurred much too frequently. It was essential that an examination be made, not only on the purely forestry side but also in the vast sawmilling industry that is associated with forestry.

Belgian Congo

• The advantages and disadvantages, in relation to local conditions, of the method of spaced-group planting (see *Unasylva* Vol. 7, No. 2 "Spaced-group planting" by M. L. Anderson) were discussed in a paper submitted to the Fourth World Forestry Congress. Possible advantages are considered to be:

1. reduced cost of afforestation compared with traditional methods;
2. facilitates the establishment of stands on poor, stony or degraded soil and on soil liable to erosion;
3. in the case of mixed stands to be established on irregular ground, permits the choice of the best ecological conditions for each species;
4. possibility of wide spacing of groups to allow a vegetative cover for forest grazing;
5. facilitates stand conversion. A forest worked by clear-cutting in patches, groups or strips can be reforested by the spaced-group planting method with one or two selected species to replace the original growing stock, and this artificial restocking can be gradually extended as the original forest is cleared.

British Honduras

• During 1953, it was possible to restate forest policy, laying greater emphasis than ever before on the necessity for forest reservation. A policy statement was approved by the Governor in Council, together with an "outline program for forestry." The first of the immediate aims of the Forest Department is "to establish an adequate forest estate by the creation of new forest reserves on Crown land." Once an adequate forest estate is established, the aim must be to enumerate and stock map the areas with a view to licensing concessions for 20-year periods for sawmills working on a sustained yield basis; to prescribing maximum and minimum cuts with area control; and to achieving a much higher degree of utilization per acre than the present "creaming."

A third objective is to implement various afforestation schemes under the Development Plan, according to detailed working or planting plans aimed at

(*a*) the replacement of the present cut of mahogany and cedar by planting and assisted natural regeneration;

(*b*) the replacement of about three-quarters of the present cut of pine by planting and protection of natural regeneration on limited areas.

Canada

• The Forest Club of the University of British Columbia is the publisher of a comprehensive *Forestry Handbook* designed specifically for field practitioners in the province. The major subdivisions of this workmanlike publication indicate the wide range of knowledge and skills which the forester needs to have at his command:

(*a*) the major standardized engineering practices;

(*b*) the fairly well standardized sampling methods used in various kinds of inventories and surveys;

(*c*) control of fire;

(*d*) the identification and control of the forest insects and forest tree diseases;

(*e*) the identification of the many important tree species;

(*f*) knowledge of the various systems of forest classification worked out by the experts;

(*g*) knowledge of the basic silvicultural systems and accepted measures for appraising results;

(*h*) methods of planting and recommended practices for different species and types;

(*i*) the determination of rotation, allowable cut, etc., and the technical processes which have been evolved for each;

(*j*) the technology of the principal species;

(*k*) logging safety and first aid;

(*l*) practices relating to the ownership and disposal of Crown land;

(*m*) the accepted scale and grading methods applied to cut timber;

(*n*) the many growth and yield tables which have been prepared.

Information on all of these, together with well-selected statistics on forest industries, information about forestry organizations and businesses, and various standard conversion factors, are covered in the book. The authors recognize that improvements and changes will be desirable in subsequent editions, and revision about every four years is contemplated.

• During the past decade Douglas fir plywood has become recognized as a valuable structural material, having special properties making it desirable for certain forms of use; and design methods, taking into account these special properties, have been developed by research institutions. The significant findings on design have been brought together by the Plywood Manufacturers Association of British Columbia and published in a *Technical Handbook for Engineers and Architects*, which deals with plywood design fundamentals, the design of built-up beams with plywood webs, and stress analysis of stressed skin panels with plywood covers.

• *The Annual Report Highlights* of the Ontario Department of Lands and Forests represents a most welcome departure from the usual prosaic and too often uninspiring annual reports of forest departments. It presents in concise narrative and pictograph form the outstanding achievements during the period. This is an interesting and understandable method of presentation which helps to create wider appreciation of the problems met with in promoting the wise use and conservation of the natural resources of lands, waters, forests and wild life, and the work involved in administering them, both from the standpoint of the need of today's citizens and those of tomorrow.

Ceylon

• Fifteen thousand young trees, including seedlings from Canada, Japan, the United Kingdom, and United States were planted with ceremony during a "Tree Planting Week" in October last. The object of the campaign is to make the people more "tree conscious," encourage the planting of valuable timber species, and to counteract [illegible] ting of trees. The Ministry of Agriculture distributed Rs 30,000 among the 20 agricultural districts in the Island to be offered as prizes to foster the campaign.

Chile

• Plantations of radiata pine (*Pinus insigne*) exist at present from the province of Valparaíso (at 32°40'S) to the province of Llanquihue (at 42°S). However, by far the most suitable region is the so called "Concepción region" comprising the seven provinces of Maule, Linares, Ñuble, Concepción, Bío-Bío, Arauco and Malleco, southwards from 35°S to about 39°S. The main plantations occur on the coastal part of these provinces and in the region of rivers Laja and Bío-Bío in Concepción, Bío-Bío and Ñuble provinces.

Radiata pine prefers a climate with heavy winter rains. The annual rainfall at Concepción is on an average 1,300 mm., of which about 80 percent occurs in the winter months, from April to August. Inland, in the central valley, the rainfall is somewhat lower. The temperature in this optimum zone ranges from an average maximum of 20°C in January to an average minimum of 8°C in July. In winter the temperature often goes below freezing point, sometimes reaching -8°C.

The plantations have been made chiefly on poor, dry and sandy land, partly flat, as around Yungay, but mainly on hilly, high lying tracts on the coastal Cordillera, where the many steep slopes are liable to erosion. Many of the plantations are on land which has been cleared from natural forests and was for years planted with wheat, but became eroded. Thus *Pino insigne* has been an important weapon in erosion control.

Plantations may be readily established by planting, the principal method, or by sowing or seed spotting. After the first clear cut, it has been found that natural regeneration is strong and easy. The planting is done during the rainy winter, from May to August and mainly small plants, sown the previous spring, September-October, are used. At present about 2,500 plants are planted per hectare.

Planting is mainly done by private initiative but the Government has created several nurseries, supplying plants at low prices. The plantations have 30 years' tax exemption, which naturally has greatly encouraged planting activity. Many of the plantations belong to privately-owned farms or to companies. However, the numerous planting societies have planted large areas and sold "parcelas" of one hectare to anyone interested in investing his money in "safe and profitable" pine plantations. Credit up to five years is usually granted and the

common opinion is that this "savings-bank" method has been of considerable importance in forming the existing large radiata pine plantations. In addition, considerable areas have been planted by government controlled institutions, such as the Corporación de Fomento de la Producción (CORFO), by the numerous social security "Cajas" which are very important and characteristic in South American countries, and by the Chilean Forest Service. (See also *Unasylva* Vol. VIII, No. 4 "Radiata pine in Chile.").

Colombia

• The University "Jorge Tadeo Lozano" in Bogotà has established a Faculty of Indo-American Natural Resources. It is intended to train technical experts to preserve, develop and exploit the large natural resources of the country. Upon completion of their training, these men will be in a position to undertake the organization of centers for the development of agricultural and related industries, and for the proper utilization of wastelands, forests and water resources. The Dean of this Faculty is the Chief Forester of Colombia.

Cyprus

• A recent number of *Forest Treasures*, issued by the Cyprus Forestry Association, contains the following open letter from the Conservator of Forests to all members of the public who intend to pass through the forests this summer:

"You are cordially invited to visit and enjoy our forests this summer. They are yours to enjoy but they are also yours to protect. As you ride or walk through their welcome shade and picnic in their beauty-spots, please remember that a moment's carelessness on your part may destroy them or cause irreparable damage. A cigarette-end, a match, the embers of a camp-fire or even a piece of broken glass exposed to the sun, may cause a forest fire which can turn a whole green hillside or valley into a barren waste that will take many years and much capital to clothe again with trees, and may even remain an ugly, eroding scar for ever."

Finland

• Three national surveys of the whole country have been carried out in Finland, the first in 1921-24, the second in 1936-38 and the third in 1951-53. From the material gained in the second survey, it was possible to assess the loss of forest resources to the country in 1944 through the cession of territory to the U.S.S.R. This amounted to 3.2 million hectares of forests with a growing stock of 190 million cubic meters and an annual growth of 4.9 million cubic meters.

FINLAND: NATIONAL FOREST RESOURCES, 1921 - 1953

	1921 - 24	1936 - 38	1944	1951 - 53
Forest area (million hectares)				
TOTAL	25.2	24.8	21.7	21.8
Northern part	11.4	11.3	10.1	10.1
Southern part	13.8	13.5	11.6	11.7
Productive forest	20.1	19.6	17.1	17.3
Growing stock (million m³ incl. bark)				
TOTAL	1 588	1 560	1 370	1 491
Northern part	540	534	483	513
Southern part	1 048	1 026	887	978
Pine	777	706	624	652
Spruce	480	503	441	532
Birch	290	295	257	273
Other species	41	65	48	34
less than 10 cm. at breast height	223	219	..	189
10 to 20 cm.	659	717	..	614
20 to 30 cm.	523	482	..	535
30 cm. and more	183	142	..	153
Annual growth (million m³ excl. bark)				
TOTAL	46	46	41	45
Nothern part	10	10	9	10
Southern part	36	36	32	35
Annual growth per hectare (m³ excl. bark)				
All reports	1.85	1.85	1.9	2.0
Productive forests	2.2	2.2	2.3	2.5

All inventories have employed a method of combined line and sample plot survey. The third survey was helped by aerial photography. Some data from the new inventory have been published in the *Communicationes Instituti Forestalis Fenniae*, from which the following figures have been taken:

Greece

• This translation from the *Critias* of Plato (427-347 B. C.) has been widely reproduced in forestry periodicals:

"There are mountains in Attica which can now keep nothing but bees, but which were clothed, not so very long ago, with fine trees producing timber suitable for roofing the largest buildings, and roofs hewn from this timber are still in existence. There were also many lofty cultivated trees, while the country produced boundless pasture for cattle.

"The annual supply of rainfall was not lost, as it is at present, through being allowed to flow over a denuded surface to the sea, but was received by the land in all its abundance, and stored in impervious clay — and so the drainage of the heights could be discharged into the valleys in the form of springs and rivers with a great volume and a wide diffusion. The shrines that survive to the present day on the sites of extinct water founts are evidence for the correctness of my present argument."

Mexico

• A poster contest was recently held in Mexico on the subject of "The Tree and its Role in Mexican Life" as part of a nation-wide tree-planting and conservation campaign. The Under-Secretary for Natural Resources, in presenting the awards, said that forests were unquestionably one of the greatest heritages of the nation and therefore to be protected by all sections of the public. He thanked the participants in the contest on behalf of the Government for this valued co-operation towards "the conservation of our forests."

New Zealand

• For a long time forestry, the timber trade and wood users generally in the country have felt the need for a journal devoted exclusively to their interests. *The New Zealand Timber Journal and Forestry Review* has appeared to meet that need. In establishing this journal, the first publication of its kind in New Zealand, the dominating motive has been how best to serve forestry and timber, and all their allied interests. The new monthly is designed to provide a medium for supplying foresters, saw millers, timber merchants and timber consumers with information about themselves and their activities; to develop circulation among all wood users, but especially builders, architects, local bodies, Government departments and trade circles; to achieve a high standard in technical and trade contributions; to become an open forum for

frank discussion of problems; to serve the industry with the most up-todate news and statistics; and, finally, to assist the timber industry wherever possible in the fields of promotion, publicity and public relations.

Northern Ireland

• In an attractive illustrated pamphlet issued by the Ministry of Agriculture, Northern Ireland, it is stated that forest policy is governed by three principal factors.

1. There is the compelling need, which two world wars have so painfully demonstrated, to reverse the centuries-old process of deforestation and create home-grown timber resources equal at least to emergency requirements.
2. There is the need, no less compelling, to provide productive work in rural areas of serious unemployment, the existence of which not only impoverishes the areas themselves but, by causing a drift to towns and overseas, accentuates the social problems of the whole country. Afforestation projects in these areas (which are predominantly marginal land) offer an ideal solution by providing a source not only of immediate employment but of future national wealth.
3. Though private planting can contribute usefully to the solution of both these problems, under present economic conditions any such contribution can inevitably do no more than touch the fringe, and the principal share of direct action must therefore be taken by the State.

The program which has resulted from these considerations of policy, and which is now being carried out is the creation within the next fifty years of a total area of 150,000 acres (61,000 ha.) of productive State forest, with a sustained yield roughly equal to the present level of consumption of timber, some 30,000 standards annually or 5 million cubic feet. of sawn timber (141,000 m³.). This great enterprise is made feasible by the fact that the demand is overwhelmingly for softwoods, which will grow on lands that cannot economically carry stock or crops. In former days, when the demand was for hardwoods for barrel staves, charcoal and shipbuilding, forestry and agriculture were in competition for the same type of land, as useful hardwoods will not grow well on poor land. But now forestry and agriculture, so far from being in competition, are complementary to each other - the new plantations providing wood for use on the farms, shelter for beasts among the open hill tops, and generally priming the pump of agricultural well-being in areas where the poverty of the soil has only too often resulted in the impoverishment of its occupiers.

Philippines

• The First Philippine Forest Conservation and Reforestation Conference was held in Manila on 30 September and 1 October 1954. The President of the Philippines called this conference and entrusted its organization to the Secretary of Agriculture and Natural Resources, as a valuable step towards finding ways and means for the orderly utilization and proper conservation of the country's forest resources.

Some excellent papers were contributed to form the basis for the open discussions. The main titles were:

Necessary balance of forest cover by Valentin Sajor, Chief, Division of Forest Investigation;

Logging systems under sustained yield management by Felipe R. Amos, Director of Forestry;

Forest exploitation in relation to forest conservation by Carlos Sulit, Chief, Administrative Division, Bureau of Forestry;

Physical protection of the forest by P. San Buenaventura, Chief, Division of Reclamation and Reforestation;

Reforestation with public funds by José Viado, General Inspector of Reforestation Projects;

Reforestation through private initiative by José Mapa Gomez, President, Sugar Planters Association;

Educational campaign for forest conservation by Luis Serrano, *The Manila Times*, and Roberto Villanueva, *Manila Chronicle*.

H. G. Keith, FAO Technical Assistance Officer, drafted a statement on the nation's forest policy for discussion by the conference.

Sweden

• In 1935, the Boliden Mining Company started to manufacture the Boliden Salt Wood Preservative. At that time there were seven or eight creosoting plants in Sweden treating wood for the big industrial consumers, but the high cost of the equipment precluded the establishment of small scale plants to serve the small consumer. Salt treated lumber, which is clean and odorless, can find many uses where creosoted wood cannot be used, but the potential market could not be tapped until a new and less expensive type of plant had been developed which was cheap to construct with relatively unskilled labor. Such a plant was designed by the Boliden Company consisting of the following units: a treating cylinder, pressure cylinder, compressor; dissolving, mixing storage tanks for the treating solution; and a few pipelines and valves. The simplicity of the equipment made it economical for even small wood industries to build their own plants, with the result that the use of treated wood was considerably extended.

The original salt put on the market in 1935 was a mixture of arsenic acid, sodium arsenate and sodium bichromate, which was then mixed with a solution of zinc sulphate. This solution produced a chemical reaction leaving precipitates of insoluble chromium and zinc arsenates in the fibers, but had the disadvantage of also producing some soluble sodium sulphate. In 1949, two new salts were put on the market, in one of which some of the zinc and in the other all of the zinc, was replaced by copper. These ingredients resulted in a complete absence of any soluble salt in the treated wood. Wood so treated is particularly suitable for constructions exposed to humidity, such as fencing, silos, water-pipes and drinking troughs, and has proved a satisfactory building material in tropical countries.

The largest construction of salt treated wood in Sweden is the flume of the Hjälta Power Station. There are now 63 treating plants working in the country and most local timber dealers carry treated wood in stock. The Boliden company is developing new and improved salts.

Switzerland

• Wood research societies were established in Germany (DgFH) and Switzerland (LIGNUM) early in the thirties, and in Austria (OeGH) after the second world war. These societies have devoted their combined energies to timber production research and utilization in an effort to bridge the gap between research and its application.

As the problems of forestry and wood utilization in these three countries are in many ways related, mutual exchange of ideas has proved very valuable, and their second "Three-Country-Meeting" was held in Switzerland, 20-25 September, 1954. The meeting was organized by LIGNUM in two separate parts, each dealing with a major problem of wood utilization. The first part, held in Lucerne, consisted of a symposium of papers on the question of how to increase the timber yield. As the capacity of the wood-working and, in particular, the sawmill industry in all three countries has, generally speaking, been extended beyond the available sustained raw material supply, increased timber supplies are of major concern to primary consumers. The papers presented on research in the field of forest productivity were supplemented by field trips to nearby forests where modern equip-

nt and methods for improved timber harvesting were demonstrated in action. The meeting also provided an opportunity to visit the 1954 Swiss National Exhibition of Agriculture, Silviculture and Horticulture, which was held currently at Lucerne.

The second part of the meeting, which took place at Biel, was devoted to the problems posed by the ever increasing trend to substitute structural timber by other materials. Delegates and guests visited the up-to-date Swiss Woodworking School, founded in 1952 as a training and education center for timber technicians, sawmill managers, carpenters, and other woodworking executives. Timber experts from the three countries contributed a series of papers on problems and new developments in the field of timber engineering, wood technology, utilization of timber for interior finishing, etc. The meeting concluded with visits to particular examples of timber engineering, such as wooden bridges, market halls, etc. and some modern wood-working factories.

United Kingdom

• Decay or timber in boats often necessitates extensive repairs and considerable expenditure, and is most serious in vessels that are laid up for part of the year or held in reserve. A recent publication, *Prevention of Decay of Wood in Boats* (Forest Products Research Bulletin No. 31 of the Department of Scientific and Industrial Research) describes the fungi responsible for this decay and the conditions under which they develop.

Decay is caused by wood-destroying fungi, living plants which feed on damp timber and through which their filaments actively penetrate, causing decay. The decay may be entirely invisible or may spread to the surface. Serious risk of infection occurs if wood for construction or repair is not properly selected and stored, and if pieces of wood which have already begun to decay are built into boats.

While pointing out that certain eradication of active decay is difficult and expensive, the bulletin outlines certain proved remedial measures as well as methods of preventing its development in new craft by the use of naturally durable timbers and modern wood preservatives. A table is included showing the degree of resistance to decay of timbers used or recommended for use in boat-building.

United States of America

• Experiments in growing shelterbelts in the northern Great Plains of the United States were started in 1914 by the United States Department of Agriculture field station in the State of North Dakota. Much work has been done, largely on a co-operative basis, in the Northern Plains region including parts of North Dakota, South Dakota and western Montana. A total of 4,670 plantings have been made to date with 12 deciduous species, 8 conifers and 8 deciduous shrubs on a wide range of sites varying in topography, exposure and soil type. During the 1930's, much shelterbelt work was done here and elsewhere in the plains area by the U. S. Forest Service.

Climatic conditions of the area are severe, with an average annual rainfall of 15 inches (380 mm.), maximum summer temperatures of over 100°F (38°C), minimum winter temperatures of -30°F (-34°C), and a frostfree period of 130-135 days.

The main conclusions reached in analyzing experience to date are:

1. In selecting sites, slopes facing north or east are best and those facing south least desirable.
2. The land should be left fallow the summer before planting and should be freed of all live sod.
3. Best species for the outside row on the windward side are *Caragana arborescens*, *Elaeagnus angustifolia*, *Prunus virginiana* and *Lanicera tartarica*. For interior rows, green ash, boxelder Siberian elm, American elm and ponderosa pine are best; for the outside leeward row, red cedar.
4. Plantings 5 to 10 rows in width generally give adequate winter protection and have a better chance of success than plantings containing larger numbers of rows.
5. Desirable spacing between rows is 12 to 15 feet (3.5 to 4.5 m.), and in the row 6 to 8 feet (1.2 to 2.5 m.).
6. Planting must be carefully done to avoid bending the roots, and trees must be set at proper depth and the soil firmly packed about them.
7. Failures should be replanted the second year.
8. Clean cultivation should be done as long as it is possible to work among the trees without interference from the branch development.
9. All shelterbelts should be fenced to protect them against livestock, and a cultivated strip outside each belt is required to keep out weeds, persistent grass and fire.
10. If possible, all shelterbelts should be given additional water.

The methods and practices are generally well worked out, but it must be remembered that shelterbelts cannot be established and maintained without considerable work.

• The American Society of Range Management has in preparation a handbook on methods and techniques in range research. The main subjects covered include:

(*a*) methods of studying vegetation quantitatively and qualitatively by means of various sampling techniques;

(*b*) methods of inventorying vegetation by density, range condition, and key species;

(*c*) assessment and control of ecological factors including climatic, edaphic, biotic and physiographic factors;

(*d*) methods of studying root habits and developments;

(*e*) forage utilization including palatability, preference and degree of use;

(*f*) types and breeds of livestock for grazing trials, including species best adapted to a particular environment;

(*g*) general livestock procedures and management, including experimental design and methods of measuring the effect of procedure on livestock;

(*h*) experimental grazing;

(*i*) statistical estimates by sampling, with special reference to range management;

(*j*) patterns of experimental designs;

(*k*) economics of range research;

(*l*) possible studies of specific problems in range management.

The handbook, when completed, should bring together all useful modern methods and should lead in the direction of desirable standardization in range research.

The Journal of the Society continues to include articles on range problems in other parts of the world. Recent issues include papers on range management as a world problem, Argentine literature on range management, and grassland management in New Zealand.

• An FAO officer, who recently visited the new Tennessee pulp and paper mill of the Bowater Organization, describes it as the most up-to-date of its kind in the world. Initial capacity is 133,000 tons of newsprint a year and 55,000 tons of either unbleached or bleached kraft pulp for sale as pulp. Every day the newsprint output requires about 360 tons of pine groundwood and 120 tons of bleached kraft pulp, or, including that for sale, 340 tons. The daily consumption of chemicals amounts to approximately 20 tons of saltcake, 8 tons of caustic soda, 14 tons of lime and from 8 to 18 tons of chlorine, while water requirements account for some 25 million gallons (95 million liters) per day.

Steps are already being taken to increase output of newsprint to 150,000 tons, while a production level of 170,000 tons is foreseen in the next two years.

The mill, situated on an 1,800 acre (730 ha.) site alongside the Hiwassee River at Calhoun, is equipped with two 252 inch (640 cm.) wide news machines designed for speeds up to 2,000 feet a minute (600 m.) and is operating seven days a week. For sheeting and drying pulp for sale a feltless wet machine and a hot-air dryer are used. About 800 people are employed in the plant itself, and about the same number are engaged indirectly in connection with pulpwood supplies.

Pulpwood transportation to the mill is by river barge, railway and truck, and among the species of southern pines which are used are *Pinus taeda* (loblolly pine), *P. echinata* (shortleaf pine), and *P. virginiana*.

A striking feature of the whole Bowater operation is the remarkable wood-handling and preparation plant, which is unique in conception. It centers around a huge artificial " wood pond " made of concrete and 500 feet (150 m.) in diameter. This circular storage pond, believed to be the first of its kind ever built, is so designed that 30,000 cords (77,000 m³.) of pulpwood may be kept submerged indefinitely in water. Such a system has obvious advantages in maintaining the moisture content of the logs and preventing their deterioration — a factor particularly important from the groundwood aspect. Sufficient timber may be stored in the pond to keep the mill running constantly for about six weeks.

In extensive forestry operations associated with maintaining supplies of timber to a plant of this size, the Bowater Organization is acquiring 200,000 acres (80,000 ha.) of forest lands in Tennessee, North Carolina, Georgia and Alabama as its own timber reserves. Much land has already been acquired, which the company is in process of planting with pines. By the end of 1954 it was expected that nearly 10 million seedlings would have been planted.

Union of Soviet Socialist Republics

• A bound collection of reports and articles for the Fourth World Forestry Congress, written by Soviet scientists and workers in the field of forestry, includes a paper on *Forests of the U.S.S.R. and their Management* by V. P. Taseplayev of the Forestry and Shelterbelt-planting Administration, Ministry of Agriculture.

Writing of the state of forestry in the U.S.S.R. today, he emphasizes that the objects of forest management must vary from region to region because of the great variety of forest environmental conditions in the territories of the U.S.S.R. and the different stages of economic development reached in the various parts.

In the *taiga* zone, forestry must concentrate on producing for the timber needs of the national economy; on reforestation of cut-over, burned and cleared areas; and on large-scale protection against fire. In the forest-steppe zone, besides the production of the maximum amount of wood that can be obtained under sustained-yield management, a basic task is to strengthen the protective role of the forests, especially by restoration of forest cover on the upper reaches of rivers and on watersheds, as well as by favoring the formation of uneven-aged mixed stands.

In the steppe-zone, forests are primarily of importance in protection, and the task of forestry is to aid this function by appropriate silvicultural measures, including the rehabilitation of stands now of little value. New shelterbelts have to be widely planted in these regions, together with protective stands in ravines, gullies and on sands as a protection against erosion and to enable sustained harvests of agricultural crops to be grown.

In the mountains of the Caucasus, Central Asia and the Crimea, the value of the forests differs according to their location. In the high mountain regions of the Caucasus, the forests must both furnish timber and serve a protective function. In the resort areas of the Caucasus and the Crimea, the forests have mainly an amenity value, while on the Caucasian coast of the Black Sea, in moist subtropical conditions, forestry is directed towards the propagation of particular valuable species such as *Eucalyptus* spp., *Quercus suber*, *Diospyrus* sp., *Juglans regia*, as well as to ensuring the protective function of existing and newly-established plantations.

In the zone of deserts and semi-deserts of Central Asia and Kazakhstan, the purpose of forestry is to preserve and extend the scrub of white and black saxaul and other shrubs (*Calligonum caput medusae*, *Salsola richteri*). This is attempted chiefly through control of grazing and by seeding from the air. An important task is the planting of new stands to consolidate bare shifting sands. In contrast, in the green zones around Moscow, Kiev, Kharkov, Leningrad and other cities and industrial centers, forestry is concerned mostly with preserving the amenity value of the forests.

Throughout the Union, forests are classified for management purposes into the following categories:

Group 1 comprises forests of state forest nurseries, protective forests including shelterbelts and " green zones ", shelterbelt pine forests and steppe forest groups. Clearing is not allowed and cutting is restricted to regeneration fellings, silvicultural thinning and selective cutting of overmature trees. The same restrictions on cutting are in force in regard to shelterbelts along rivers, railways and main automobile roads. Forests in this category are dispersed throughout the different regions of the country but predominate in the central and southern regions.

Group 2 comprises mainly the forests of thinly-forested (forest-steppe) areas and of the central regions, especially around the densely populated industrial centers. As a rule, these forests are worked on a clear-felling system but the cut must not exceed annual growth.

Group 3 includes all other exploitable forests, notably the abundant forest resources in the northern regions of the European part of the U.S.S.R, in the *taiga* zone of Siberia, and in the Far East. All systems of cutting are allowed.

The entire management of forestry in the U.S.S.R. comes under the Forestry and Shelterbelt-planting Administration of the Ministry of Agriculture of the U.S.S.R., headed by the chief of the Administration who is at the same time a Deputy Minister. In the various Republics, Forest Administrations of Ministries of Agriculture are established, the chiefs being simultaneously deputy-chiefs of regional (territorial) agricultural administrations. *Leskhoz* is a production unit directly subordinated to the forest administration in a region or territory, and on the average composed of five forest divisions.

To carry out the work of exploring, surveying and inventorying forests, there is the All-Union Aerial Photo Forest Organization (*Lesoproyekt*) which is under the direct control of the Forestry and Shelterbelt-planting Administration. The Forest Patrol and Fire-control Service also comes under the central Administration, as does *Agrolesoproyekt* which is responsible for the planning of new forests in woodless regions.

The administration of state forest nurseries, seed collection and storage, and the provision of seed and seedlings to collective farms is the responsibility of *Glavlessempitomnik*.

For about a quarter of a century, all forest exploitation in the U.S.S.R. for state needs has been controlled by the Ministry of Forest Industries of the U.S.S.R., which continues to be the main official body in charge of extraction operations and agencies.

Selected Reviews

MANUAL OF INDIAN FOREST BOTANY. N. L. Bor. pp. 441. Oxford University Press. Oxford. 1953. Rs. 25.

A knowledge of forest botany is indispensable for the forest officer in order that he may be able to identify not only the trees of commercial value, but also the less important species and subordinate vegetation. For it is often the case that treatment of the latter determines success or failure of the dominant species.

This manual provides a useful guide to the diagnostic features of trees and other woody vegetation — branching; stems; roots; buttresses; spines; bark; the blaze or cut — the color and nature of the sap, latex or juice; leaves; fruits in their many forms; flowers.

Although much progress has been made in the systematics of botany, the last word in classification has not yet been said. The author follows Hutchinson in the order of listing groups.

PRINCIPLES OF FOREST FIRE MANAGEMENT. C. R. Clar and L. R. Chatten. pp. 200. California Department of Natural Resources, Division of Forestry, Sacramento. 1954.

This training textbook, written for the employees of the Division of Forestry of the California Department of Natural Resources, deals with principles of the job of fire-manager.

There is a certain amount of repetition and unequal emphasis on some individual elements but, according to the foreword, this is intentional. The book is divided into three parts dealing with

1. fire behavior;
2. techniques of fire control;
3. organization and management of forest fire control.

The language is clear and simple and the text could be readily adapted for training purposes in other countries to meet local conditions.

THE PRACTICE OF SILVICULTURE, R. C. Hawley and D. M. Smith. pp. 525. John Wiley and Sons. New York. 1954. U.S.$7.50.

This edition, the sixth since this textbook was first published in 1921, lays emphasis on the biological laws and economic objectives which underlie the principles of silviculture and determine their application. The authors indicate that the eight years since the preceding edition in 1946 "have been marked by a development of the practical application of silviculture unparalleled in the history of American forestry."

The first chapter "The Place of Silviculture in Forestry" introduces the detailed presentation which follows on reproduction methods, individual methods of cutting, artificial reproduction by seeding and planting, slash disposal and prescribed burning, intermediate cuttings such as thinnings, improvement and salvage, and pruning. There is also a chapter on methods of controlling cuttings. In each case the methods are described in their relation to principles and objectives so as to provide the forester with the necessary background against which to make his own decision as to time, place, and method of application. The final chapter makes the point that silviculture is not the hard and fast application of recipes as in a cook-book, but requires sound individual judgment in regard to each separate forest stand.

THE STORY OF THE KAURI. A. H. Reed. pp. 439. A. H. and A. W. Reed, Wellington, New Zealand. 1953. £2. 7s. 6d.

The Kauri, famous New Zealand giant, has in the space of a century shrunk to about one-tenth of the three million acres (1.2 million ha.) it covered when the pioneers first discovered its value, particularly for shipbuilding. Before the advent of the Maori in the fourteenth century, the Kauri had an even greater range, as the early gum hunters learned, who found the gum in many areas far from existing forests. How and why this retreat came about is not certain. Fires caused by volcanic action and lightning, great hurricanes which leveled whole forests, perhaps the advancing cold of the last age of ice, are possible explanations.

This is a non-technical book, written by a man who in his youth was a gum hunter in the nineties of the last century, and finely illustrated. It tells the often adventurous story of the exploitation of the great forests from the early days of hand labor and animal power, the problem of transporting the logs, the construction of dams without the aid of civil engineers — in fact a story of great resourcefulness in the opening-up of a new country.

AMERICAN FOREST MANAGEMENT. (American Forestry Series). K. P. Davis. pp. 482. MacGraw-Hill Book Co. Inc. New York. 1954. U.S.$7.50.

The job of managing a forest for continuous production of timber is the central theme of this book. Other purposes — watershed, recreation, wildlife, grazing — which may also require the manager's attention are discussed in more general terms.

Effective management is the integration of technological and economic factors: on the one hand, the forest status and its potential yield, and on the other hand, the economic appraisal of the land, the timber stand, stumpage and individual trees.

To apply, singly and in combination, the methods best suited to a particular forest and to the purpose of its ower is the crux of the manager's task, and a clear understanding of the principles of management will enable him to reach sound decisions.

American forest management began, necessarily, with an attempt to apply European methods to forests having a wholly coincidental similarity to the forests for which the methods were originally devised. Apparent over-abundance of virgin timber inspired little interest in management plans until recently. Thus forest management, particularly on private lands, developed slowly. But today the many plans in operation on both public and private forests have enabled the author to discuss American experience, to the extent that it may find application in other countries where forest management is in the developmental stage.

PLANTING THE SOUTHERN PINES. Agricultural Monograph No. 18. P. C. Wakeley. pp. 233. U. S. Department of Agriculture, Washington D. C. 1954. U.S.$2.75.

This publication is an excellent handbook, not only for foresters responsible for planting southern pines in the south of the United States, but for foresters concerned with tree planting in all parts of the world. The logical arrangement of the information sets a pattern which could well be followed in other works in this field.

A section on planting policy — choice of species, geographic source of seed, planting versus direct seeding, spacing, definition of plantable land, costs, yields, and records — lays the foundation for the planting practices described in detail later. Particular attention is given to the use of insecticides, fungicides, baits, and repellents; and practical information is given on seed extraction, sampling, testing, preparing of seedbeds in the nursery, making seedling inventories, storing and baling, and planting tools.

Of special interest is a chart of the normal development of seedlings in the nursery which serves as a basis for choosing the methods to be followed according to the stage of growth of the four principal species of southern pines. Foresters engaged in this field of activity may well consider the desirability of formulating similar charts as a guide to practices for the important tree species with which they are concerned.

YEARBOOK OF FOREST PRODUCTS STATISTICS 1954

This yearbook, the eighth in the series, contains official information from more than 100 countries and territories on production and trade for roundwood, processed wood, wood pulp, newsprint, paper and paperboard, and fiberboards, as well as a summary of world trade.

Price: $2.50 or 12s. 6d.

YEARBOOK OF FOOD AND AGRICULTURAL STATISTICS 1954

Part I - Production

Provides basic statistics on world agricultural production. It gives authoritative information on land use, agricultural population, crops, livestock numbers and products, food supplies and their utilization, and on commercial fertilizers, pesticides, and agricultural machinery. It also includes the more important series of agricultural commodity prices in many countries, as well as index numbers of prices received and paid by farmers, and of agricultural production.

To be issued in mid-1955.

Part II - Trade

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